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Volume 19 June 1950 Number 6

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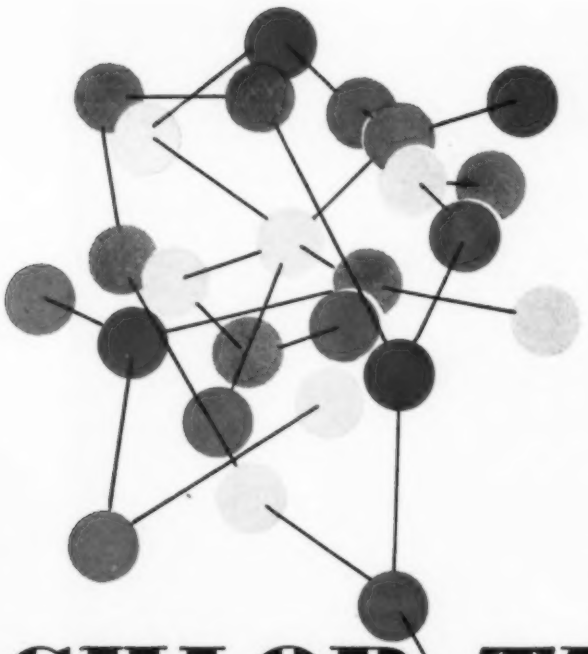

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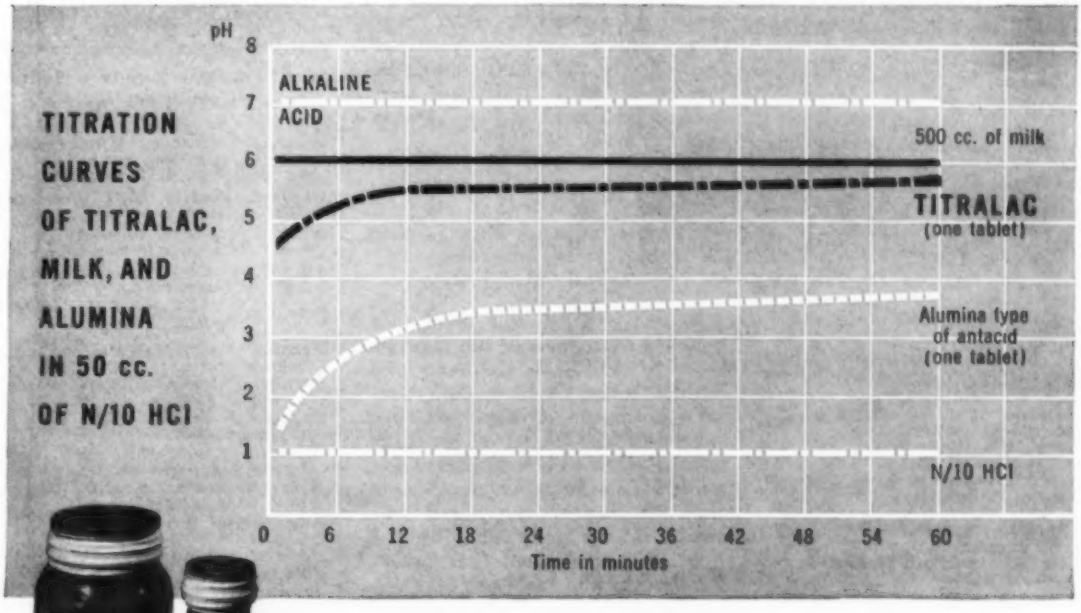

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NEWS

JOHN J. WITTMER M.D., was elected a Vice-President of Consolidated Edison Company of New York, at a meeting of that Company's Board of Directors on Tuesday, May 23, 1950.

WORD comes of the serious illness of DR. LOYAL A. SHOUDY. He was stricken on May 13, and as of our press time (May 26) his condition is still critical.

HOWARD A. RUSK, M.D., Professor and Chairman of the Department of Physical Medicine and Rehabilitation of New York University College of Medicine, was elected to the board of directors of the New York Tuberculosis and Health Association at a recent meeting of the board. DR. RUSK is Chief of Rehabilitation Service at Bellevue Hospital; Director of the Institute of Physical Medicine and Rehabilitation of the NYU-Bellevue Medical Center, Associate Editor of the *New York Times*, consultant in medical rehabilitation to the medical director of the Veterans Administration, secretariat of United Nations and the Department of Hospitals, of the city of New York. While in military service he was chief of the Army Air Forces Convalescent Services Division in Washington, with the rank of Colonel. He was awarded the Distinguished Service Medal in 1945.

ELECTED to Honorary Membership in the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS at the April meeting: CHARLES H. GANO, M.D., Pittsburgh (A.A.I.P.&S.); ROBERT J. GRAVES, M.D., Concord, New Hampshire (New England Conference); J. W. HARVEY, M.D., St. Johnsbury, Vermont (A.A.I.P.&S.); HALSTEAD S. MURAT, M.D., Middletown, Ohio (A.A.I.P.&S.); L. L. SEXTON, M.D., Hilo, Hawaii (Territorial Association of Plantation Physicians).

CARL N. NEUPERT, M.D., of Madison, Wisconsin, is Chairman, RUTHERFORD T. JOHNSTONE, M.D., of Los Angeles, is Vice-Chairman, and JEAN SPENCER FELTON, M.D., of Oak Ridge, Tennessee, is Secretary of the A.M.A. Section on Preventive and Industrial Medicine and Public Health. The program appears on page 274.

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THE University of Pittsburgh School of Nursing is offering a concentrated course for industrial nurses from June 19 to June 30.

THE "Registration Awards," which are a regular feature of the A.A.I.P.&S. Conferences on Industrial Health from year to year, were received by the following at the 1950 Conference in April, at Chicago: *First*—$100.00—MRS. OCTA B. WINTER, R.N., Supervisor of Nurses, Potomac Electric Power Company, Washington, D. C. (member, AMERICAN ASSOCIATION OF INDUSTRIAL NURSES). *Second*—$50.00—SEYMOUR LEVINSON, Industrial Hygienist, U. S. Norfolk Naval Shipyard, Portsmouth, Virginia (member, AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS). *Third*—$25.00—DR. F. VELA-GONZALEZ, Chief Surgeon, American Smelting & Refining Company, Monterey, N. V. Mexico. *Fourth*—$15.00—JOHN N. ABERSOLD, Chief Hygienist, American Smelting & Refining Company, Salt Lake City, Utah (member, AMERICAN INDUSTRIAL HYGIENE ASSOCIATION).

GRANT LESLIE BIRD, M.D., of Oshawa, Ontario, died on April 27, while in Chicago to attend the General Motors Medical Conference and the Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS. He had been identified with General Motors for more than 23 years. In January, 1947, he had suffered a severe coronary thrombosis, but, "always thorough in everything he did, he so ordered his life that he apparently overcame the conditions and seemed in good health." DR. BIRD was born in 1895 at Foxboro, Ontario, graduated from the medical school of the University of Toronto in 1921, interned at Toronto General Hospital, and started private practice at Oshawa in 1923. His association with General Motors began in 1926, when he became Plant Surgeon. After about 15 years he was retained as a Consultant Surgeon. He was a Fellow of the American College of Surgeons, and a member of the Canadian and Ontario Medical Association and the Ontario County Medical Society, having been president of the latter in 1930. He was one of the organizers of the Oshawa Clinic, which has become a center for complete

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medical and surgical service, with a staff of nine Doctors. From 1923 to 1933 he served as Director of the Oshawa Municipal Health Laboratory and the Oshawa General Hospital Laboratory. In 1935 he was elected to the Public Utilities Commission, serving two years. In 1937 he won a seat in the City Council, and was re-elected in 1938. After some years of retirement from municipal affairs he was elected to the Board of Education, of which he was Chairman at the time of his death. He was also active in the local Chamber of Commerce, as successively president, director, and member of the Executive and Advisory Committees. Long a Rotarian, he became District Governor in 1934, and maintained his interest to the last. The Oshawa *Daily Times Gazette* of April 28 said of him, in part: "Few men have made a greater imprint on the varied phases of the life of Oshawa than has DR. BIRD, and his death brings a sense of great loss to those who worked with him in the many fields in which he gave service.... Above and beyond his contribution to the life of the community in which he lived, however, were the close personal ties which he had with the families of the community he served as physician, and as friend. In addition to giving a high standard of professional service, he took a keen personal interest in the well-being of his patients and their families, and became in a remarkable way a trusted adviser and friend. In those homes in which he had, through the years, been a welcome visitor in his professional capacity, there is today a sense of real loss."

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American Conference of Governmental Industrial Hygienists, U. S. Public Health Service, Washington, D. C. J. J. BLOOMFIELD, Secy-Treas.
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American Industrial Hygiene Association 4400 Fifth Ave., Pittsburgh 13, Pa. HENRY F. SMYTH, JR., Executive Secy.
April 23-26, 1951, Atlantic City.

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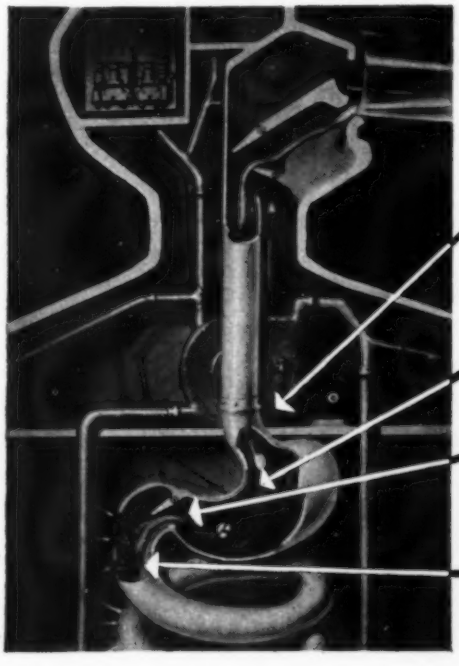

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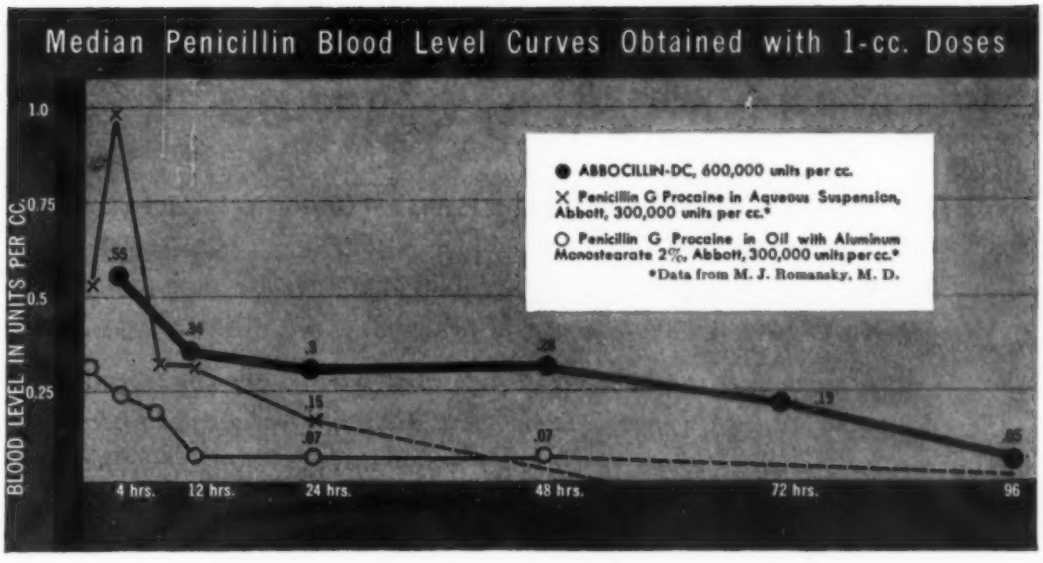

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These physiologic advantages are related mainly to the protein content rather than to the caloric content of the breakfast. In fact, when isocaloric breakfasts were compared, those with the higher amounts of protein led to the greatest beneficial effects. Breakfasts providing the lower quantities of protein (7 Gm., 9 Gm., 16 Gm., and 17 Gm. respectively) produced a rapid rise in the blood sugar level and a return to normal during the next three hours. Breakfasts providing more protein (22 Gm. and 25 Gm. respectively) produced a maximal blood sugar rise which was lower than that following the breakfasts of lower protein content, but the return to normal was delayed beyond the three hour period.

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*Orent-Keiles, E., and Hallman, L. F.: The Breakfast Meal in Relation to Blood-Sugar Values, Circular No. 827, United States Department of Agriculture, Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, Dec., 1949.

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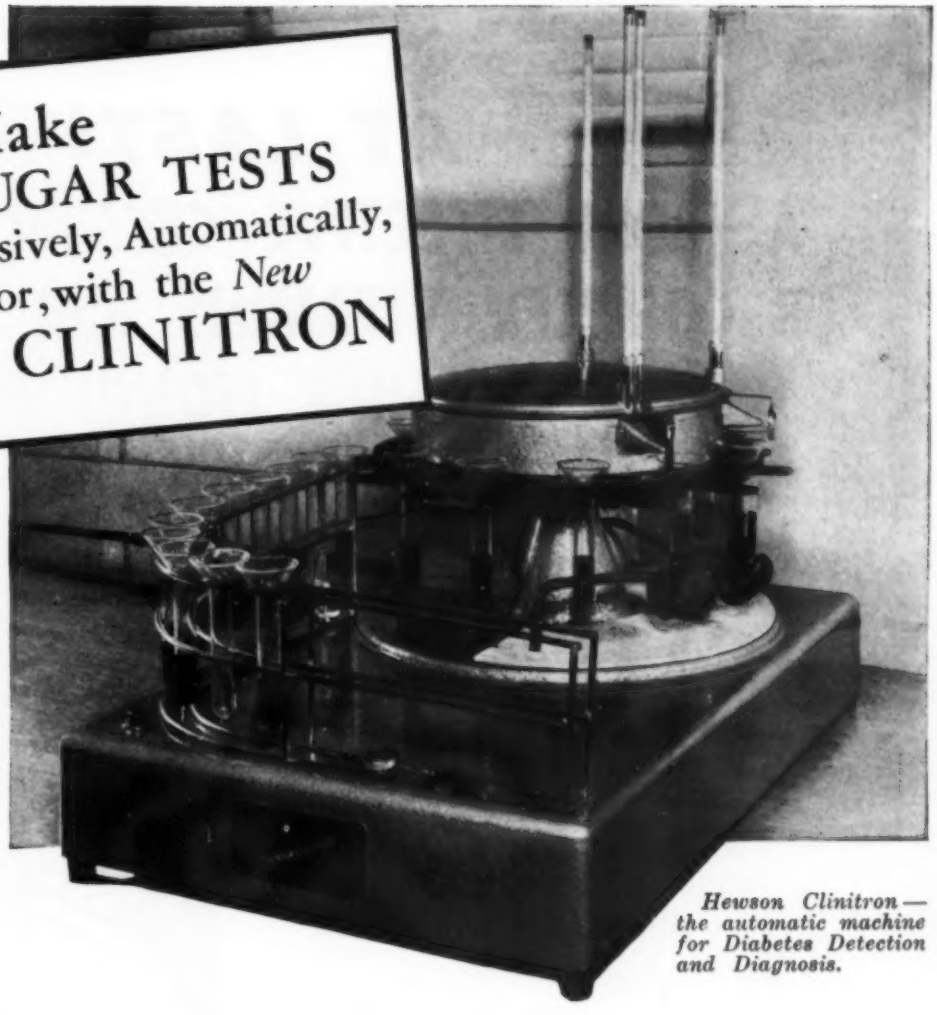

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For symptomatic control of the common cold, allergic rhinitis including hay fever, vasomotor rhinitis and sinusitis.

Well Tolerated—No Drowsiness—Neo-Synephrine Thenfadil nasal solution in clinical tests was well tolerated except for a transitory stinging in a few cases. There was essential freedom from central nervous system stimulation: trepidation, restlessness, insomnia; neither was there drowsiness.

Effective—In common colds, allergic rhinitis including hay fever, vasomotor rhinitis, and sinusitis, excellent results were reported in nearly all cases. There was prompt, prolonged decongestion without compensatory vasodilatation. Repeated doses did not reduce the consistent effectiveness.

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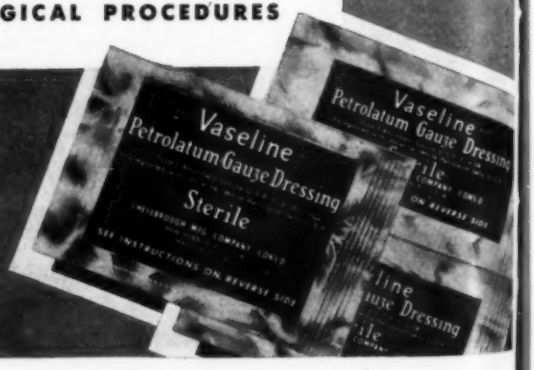

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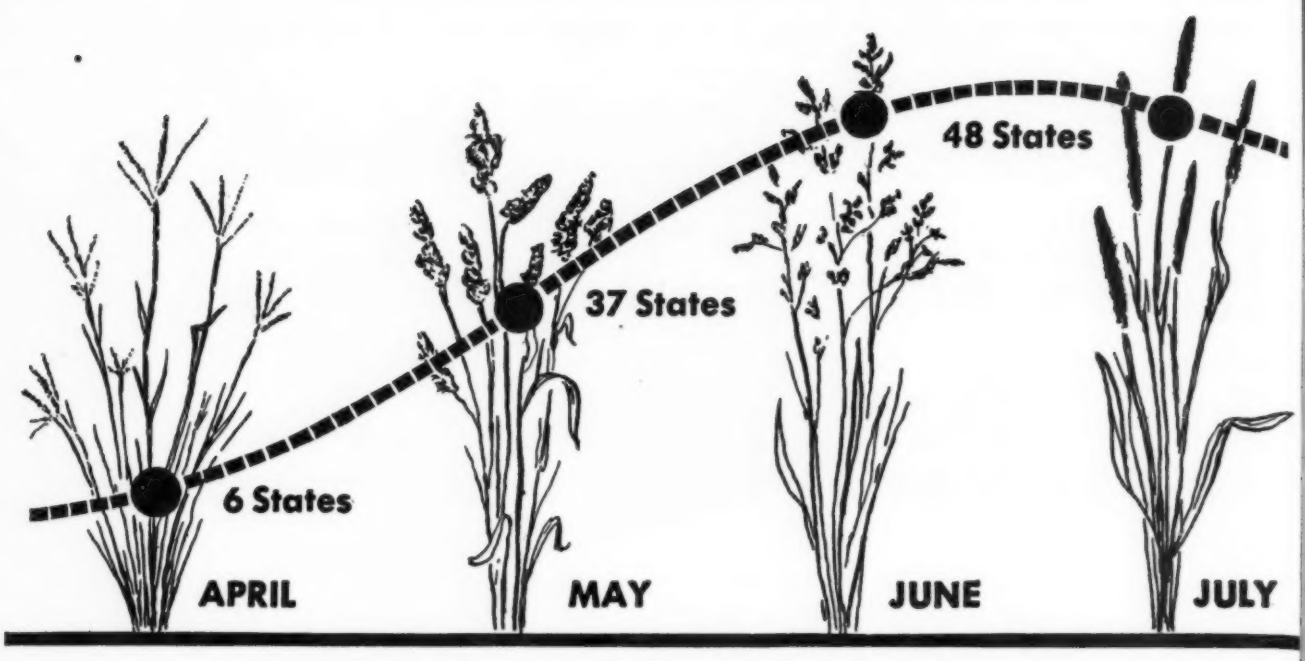

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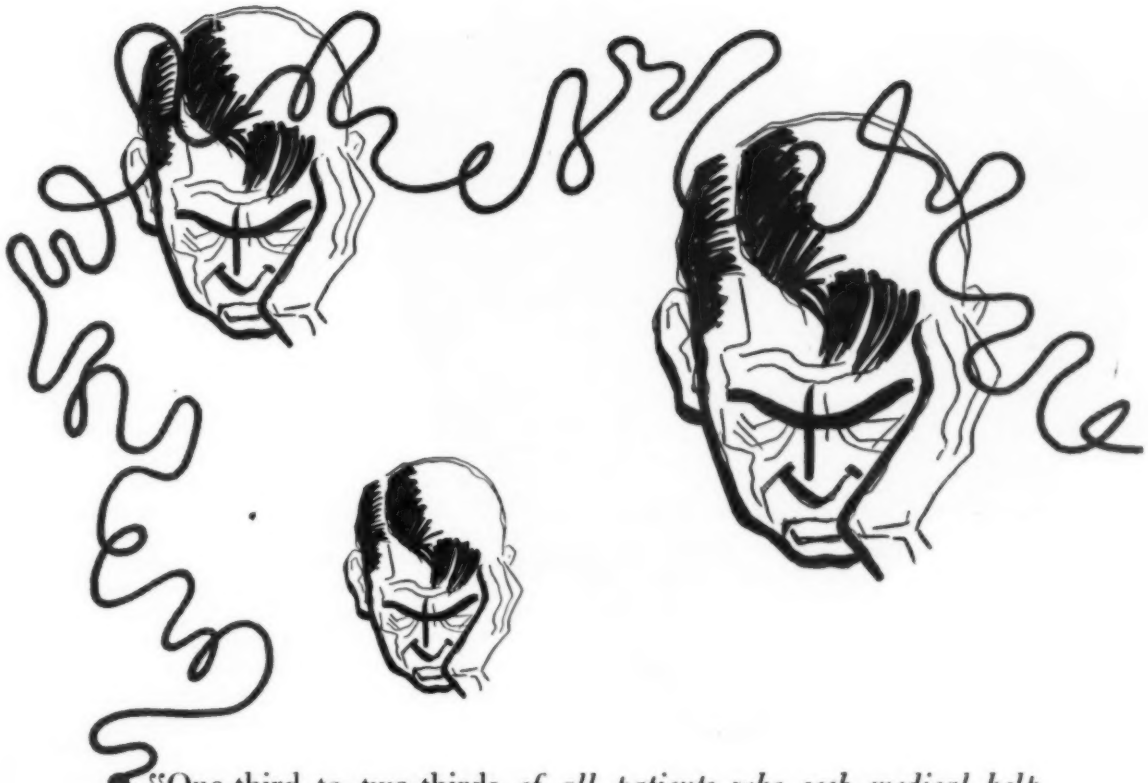

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1. Wilbur, D. L.: J.A.M.A. 141:1199 (Dec. 24) 1949

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INDUSTRIAL MEDICINE AND SURGERY

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DIABETES IN INDUSTRY

Diabetes in History

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THE beginning of this story comes with the beginning of our civilization. In the valleys of three rivers—the Euphrates, the Tigris and the Nile—according to ancient script, man began recording his experiences and his hopes. The Sumerians, having clay in their soils, moulded it into tablets, and, with the stylus, wrote in cuneiform script, from right to left. On these tablets they inscribed business and social affairs, and then baked them for permanent keeping. It is from these clay tablets that much of what we know of those times comes to life for us today. The Egyptians, living along the tributaries, shores and estuaries of the Nile, having no clay near the banks, cut the papyrus leaves and made them into sheets, and scrolls. On such sheets as these, the medically famous Papyrus Ebers was written with reed pens 3500 years ago. On one of these papyri, Ebers found the first description of diabetes. From that time on, wherever man has travelled and left records of his activities, there we also find a continuation of the story of this disease—diabetes.

At first, in Egypt, we find the story embellished and entwined with superstition and mysticism. Later, as civilization moved northward along the Mediterranean Littoral, and after the learning of the Orient had filtered through the mind of the Greeks, descriptions of disease were clarified and systematized in a way that was typical of Hellenic culture. As the centuries rolled on, and civilization continued to move farther north and to the west, clinical descriptions of diabetes became more detailed, and search for causes and hope for possible cures became more persistent.

It should be recalled here that the humane attitude toward those who were sick has changed from time to time. In Greece, in the time of Aretaeus, the Pythagorean philosophy was quite prevalent, although not universal, for at least 200 years B.C. Of this we read in Timaeus, one of the Dialogues of Plato, that "no attempt should be made to cure a thoroughly diseased system, since such a man is of no use to himself or his family or the State." While this attitude in our day seems cruel and heartless, there are certain extenuating circumstances in the light of a broader interpretation of history which mollify the seeming inhumanity of the Pythagoreans of those days. As you will recall, one of the tenets of Pythagorean philosophy was the belief in migration of the soul. The soul of man leaving him at his death will be reincarnated into the body of another, yet to be born. The Pythagorean hoped that the next cycle for his soul would be happier than the one before; he looked forward to a kind of heaven and a better future, as man has always done.

In the light of such thinking, it does not seem unreasonable to assume that the Pythagorean, having his soul locked in a diseased and suffering body, might willingly look forward to a release from his crippled encasement, to the time when his soul would again be allowed to enter upon a happier cycle of childhood, youth, and a virile adult life, capable of doing all the things that wishful thinking might conjure up for him. This philosophy did one thing for the Pythagoreans that had real value. It led corporeal man to a contemplation of his soul, and it led the soul of man to contemplate his body.

With this in mind, what might have been interpreted as barbarous cruelty, takes on quite a different meaning.

The Greek Period

ARETAEUS, of Cappadocia, (30 A.D.- 90 A.D.) as will be noted by the period in which he lived, might easily have been influenced by the advent of Christianity and the decline of Paganism. He might well have said, I too, "believe that man is his brother's keeper," and therefore all the sick, curable and incurable alike, should be cared for and treated, and their lives prolonged with the hope of relief and cure of their diseases.

Thus it was that attempted cure for incurable diseases, had its beginning, in so far as history records.

Celsus (30 B.C.- 50 A.D.) was not a practicing physician, but he wrote treatises on medicine, introduced or popularized the use of mercury, opium and antimony, and, among other things, left a description of diabetes.

THE first six presentations of this Symposium comprised the "Seminar on Diabetes in Industry," held at the Medical Conference of the Industrial Hygiene Foundation, as part of its Fourteenth Annual Meeting at Mellon Institute, Pittsburgh, Pennsylvania, November 16, 1949. The other presentations are credited as to source in their respective footnotes.

Aretaeus gave a good description of diabetes and constructed the word "dia-betes" which means to pass through. History says that Aretaeus was a great clinician and easily ranks next to Hippocrates. Said Aretaeus, "Diabetes is a wasting of the flesh and limbs into urine from a cause similar to dropsy, the patient never ceasing to make water, and the discharge is as incessant as a sluice let off. The patient does not survive long for the marasmus is rapid and death speedy. The thirst is ungovernable, the copious potations are more than equalled by the profuse urinary discharge, for more urine flows away .... How indeed could the making of water be stopped, or what sense of modesty is paramount to pain? The disease is caused by some of the acute diseases. It is suspected that the pernicious influences of those diseases which attack the bladder and kidneys contain in themselves the cause of this disorder."

Galen (A.D. 131-201), a great intellect of his day and a reorganizer of medical philosophy and the medical profession as well, was the founder of experimental medicine. Galen described diabetes as "a weakness of the kidney which cannot hold back water," and he spoke of the urine of diabetes as unchanged drink. This and other Galenic theories were accepted without question for centuries.

The Orient

HINDU medical writings in the sixth century refer to diabetes as Madhumeha, honey urine. They described diabetes as a disease of the rich and one that is brought about by gluttonous over-indulgence in rice, flour, and sugar. This order of disease is ushered in by the appearance of morbid secretions about the teeth, ears, nose, and eyes. The hands and feet are very hot and burning, and the surface of the skin is shining as if oil had been applied to it. It is accompanied by thirst, and a sweet taste in the mouth. The different varieties of this disease are distinguished from each other by symptoms of deranged humors, and by the color of the urine: (1) In this disease the urine is nearly of the natural color, without any sediment. It is white, very cold, has no smell, and is like water. (2) The urine is like the juice of sugar cane in color and taste. (3) In this variety, the urine becomes thick after standing some time. (4) When the urine is of a white color, it is thin and pure above, and thick below. (5) At the time of micturition, the hair over the body is erect, and the urine has a copious white powder, as if flour had been mixed with it. (6) In this variety the urine is the color of semen, which sometimes appears mixed with it. In the chronic form, this is incurable. (7) When the urine lets fall a hard and small deposit like sand. (8) When there is a copious secretion of urine which is sweet and cold. (9) When there are frequent calls to make urine, which is discharged in small quantities.

This is the diabetes mellitus, known to the Hindus; its danger was appreciated before the disease was known in Europe. "All the hereditary and congenital forms of this disease are incurable, and if not properly treated, terminate in sweet urine, which is incurable."

The Chinese and Japanese, 1750 years ago, wrote that the urine of diabetics was large in amount and so sweet that it attracted dogs, and in the description of this disease they noted the occurrence of furunculosis.

Avicenna (980-1027), called prince of physicians, was the great Arab doctor of his day. He claimed that diabetes may be primary or secondary to another disease. He observed that diabetic patients have irregular appetite, suffer great thirst, nervous exhaustion, an inability to work, and loss of sex function. Avicenna believed that in diabetes the liver is affected. It may be that he noted some cases with enlarged livers, which we now recognize as bronzed diabetes. The urine leaves a residue like honey. He observed that carbuncles and phthisis are frequent complications. He described diabetic gangrene, and it was his opinion, all in all, that treatment was not effective. One may well ask, what are the essential clinical features of this disease left undescribed by Avicenna?

Europe

OTHER observations were recorded by Italian, Portuguese, Greek, and Dutch physicians, but no definite advances were made until the time the historian designates as the Second, or the Diagnostic, Period.

Paracelsus (1493-1541) was learned in chemistry, particularly in metallurgy, which he would have made the servant of medicine had he the power to do so. He evaporated a liter of diabetic urine and recovered four ounces of "salt," which he said makes the kidney thirsty and causes polyuria.

Willis (1621-1675), of Oxford University, claimed diabetes was primarily a disease of the blood, and that the sugar which first appears in the blood, later appears in the urine. He made the best qualitative urinalysis possible in his time; he noted the sweetness of diabetic urine, and differentiated diabetes mellitus from diabetes insipidus. Pavy, in the Croonian lectures, claimed that Willis was first to comment upon the sweet character of the urine in diabetes, but this is incorrect in the light of Hindu, Japanese, Chinese, and Arabian descriptions of the disease.

Brunner in 1682 discovered that removal of the pancreas produces polyuria and polydipsia in the experimental animal. But it appears that he did not realize that the pancreas had a digestive function, and that he did not appreciate the significance of the polyuria and polydipsia which he described.

Dobson in 1776 demonstrated that diabetic blood is sweet and diabetic urine contains sugar that ferments.

Cawley in 1788, for the first time, diagnosed diabetes by demonstrating the presence of sugar

in urine. He also observed that the disease may result from disease of the pancreas such as occurred in a case of diabetes in which he found pancreatic calculi, postmortem.

The Englishman Rollo (1796) should be credited with having laid the foundation for systematic treatment of diabetes by restricted dieting. This was the beginning of the period of Empiric treatment. Rollo was first to show that diabetic urine with mineral acid produced oxalic acid, and diabetic blood treated with nitric acid yielded more oxalic acid than normal blood. He described a patient 25 years old who had the odor of decaying apples on his breath. Rollo also denied the old claim that in diabetes, urinary output is greater than fluid intake.

Then came Bouchardat (1806-1886) with whom the modern point of view of diabetes begins. We may really say that in the last 60 years more has been learned of diabetes than in the preceding 1850 years. Evaluating Bouchardat's work in diabetes, we must admit that it was remarkable. Bouchardat used the fermentation test, the polariscope, and copper solutions for detection of sugar. In the treatment of diabetes, he advised the use of fresh fats as a substitute for carbohydrate, the avoidance of milk because of its lactose, and the use of alcohol as a food. He invented gluten bread, stressed the advantages of using green vegetables, instituted fast days, and emphasized the importance of under-nutrition. He prescribed exercise for the diabetic patient and administered alkalies. He called attention to the fact that, during the siege of Paris, when food was scarce, glycosuria disappeared in diabetic patients, just as it did in Germany 85 years later, during World War I.

From the time of Avicenna to Bouchardat some 800 years intervened. The former gave us the best description of the disease to his day, and the latter laid down the most rational treatment up to his time. Both description and treatment were empiric, but they marked great advances over preceding periods.

The Experimental Period

CLAUDE BERNARD (1878), famous for his experimental puncture of the floor of the fourth ventricle with resulting glycosuria, showed that in diabetes there is primarily an excess of sugar in the blood and, after that, in the urine. In this he was anticipated by Wyatt and by Dobson. Bernard demonstrated sugar in blood taken from the right heart. He was the first to study glycogenic function of the liver, and after isolating glycogen he made important studies of the pancreatic juice pertaining to emulsification of fats, their passage through the intestines, and its power of converting starch into sugar. Even in that day, he made accurate blood sugar estimations.

Pavy (1829-1911) devoted 20 years of intensive study to this disease. After making simultaneous blood and urinary sugar estimations, he came to the conclusion that there is a definite relationship between the degree of hyperglycemia and glycosuria. This was verified by Von Noorden. Pavy claimed that sugar is not made and ordinarily is not stored in the liver. He originated the well-known Pavy's solution for quantitative sugar analysis. Pavy insisted that, by dietetic management alone, the urine will become sugar free and health restored, even though sugar might return at some future time. Diabetes, he said, is a progressive disease, the underlying pathologic condition making gradual advancement. He compared the course of the disease to that of locomotor ataxia, in so much as there are quiet periods alternating with periods of progress, and believed that by strict dieting the life of the patient would be prolonged.

Von Noorden taught that both the liver and the thyroid gland played an important role. He made extensive studies, anticipating many present-day workers in the metabolism of diabetes.

Naunyn devoted almost his whole life to the study of diabetes and diseases of the liver and the pancreas. He believed that regardless of the pathologic or metabolic changes in the individual patient, hereditary tendency to the disease (the "diabetic anlage") is a most important factor and that it was demonstrable in 30% of his cases. Naunyn accounted for three forms of the disease: diabetes of the young, of the aged, and organic diabetes; this group including those cases associated with diseases of the pancreas, liver, thyroid, and diseases of the nervous system. "Diseases of the pancreas," he said, "have only in rare instances been determined with certainty as the cause of diabetes. These affections are pancreatic calculi, pancreatic cirrhosis, neoplasms, and cysts."

Metabolism

BEFORE entering upon a discussion of metabolism in its relation to diabetes, let us recall the names of those who paved the way. Galen, Servetus, Columbo, Cesalpinus, Sarpi, and, best known of all, Harvey, the great crystallizer of all knowledge pertaining to (if in reality not the actual discoverer of) the circulation. Hemmeter credits discovery of the lesser circulation to Servetus in 1546, and discovery of the greater circulation to Cesalpinus in 1569. Harvey's description came in 1628, and although Harvey is generally conceded by the English-speaking world to be the discoverer of the circulation of the blood, it is said that he was sorely perplexed because he could not understand the purpose in the blood's rapid flow throughout the body. Two hundred years elapsed between the time of Harvey and that of Priestley, who discovered oxygen, and Lavoisier, who made the first "basal metabolism" estimation and discovered that metabolism was increased by food, work, and cold. When we realize that a knowledge of metabolism is the first essential in the true understanding of diabetes, the importance of the place that Lavoisier holds in the history of the disease is clearly defined.

The early work of Pettenkofer and Voit, Lehman, Ebstein, Leo, Magus-Levy, Kaufman, Von Noorden, and many others indicates that caloric need of the diabetic is equal to that of normal man. If there is an abnormal deviation at all, it is on the side of a greater than normal basal metabolism. Ordinarily, oxygen absorption, carbon dioxide elimination, and heat production are normal or above normal in the diabetic.

Petter in 1875 discovered acetone in diabetic urine.

Kaulich distilled 700 pounds of diabetic urine and purified enough acetone to identify it by elementary analysis.

Kussmaul discovered acetonemia in 1874.

Stadelmann, a pupil of Naunyn, discovered B-oxybutyric acid in 1833 and recognized that diabetic coma was the result of the increased formation and accumulation of acids.

Acidosis

NAUNYN first employed the term acidosis to designate abnormal accumulation of acids in the body. Although formation of acids goes on in normal health as a physiological process, certain metabolic disturbances produce abnormal acids, such as uric, oxalic, homogentistic, and most important to us here, oxybutyric acid. Oxybutyric acid undergoes oxidation into diacetic acid, from which acetone is formed.

Said Naunyn: "By diabetic acidosis, I mean the formation of B-oxybutyric acid in the processes of metabolism. Acetonuria and diaceturia are part of acidosis; for both substances originate from oxybutyric acid. I know that certain prominent chemists may have maintained the opposite view, that acetone and diacetic are not formed from oxybutyric acid, but I also know that very prominent chemists may be mistaken in their reports. For in the very cases in which they found no oxybutyric acid, and in the specimens which they kindly sent to me for examination in my laboratory, I succeeded in demonstrating oxybutyric acid in the urine. Said Magnus-Levy: Acetone bodies are eliminated always when carbohydrates are lacking in the organism or when they are not utilized in a normal way. Under these conditions, indeed, the oxidation of protein and fat will be deficient and oxybutyric acid will appear in the urine. Acidosis, and I repeat it again and again, does not only, or perhaps not at all, depend upon the formation of acids, but also and perhaps exclusively upon their combustion."

Sugar is the most combustible product consumed in the organism. When sugar is not oxidized, total combustion is lessened, and those other substances, that should be oxidized simultaneously, accumulate unburned. Thus, said Rosenfeld, "Fats burn in the flame of carbohydrates." Von Noorden considered acetone a by-product of protein. The greater part of the acetone bodies, however, have fatty acids as their immediate precursors. Carbohydrate combustion is the "primary oxidation." Protein and fat combustion is the "secondary oxidation." Magnus-Levy does not admit Von Noorden's distinction between primary and secondary oxidation, and believes that total oxidation is but a single process.

As biochemical disturbances came to be understood, treatment of the disease was gradually established on a better basis. Discovery of acidosis brought forth alkali therapy. While today this is looked upon as a mixed blessing, it no doubt was a useful step in the evolution of a more complete knowledge of the disease.

Up to 1903 no one, perhaps, had stated more clearly than Naunyn the principles that were applicable in the dietetic treatment of the disease. He advised first of all prophylactic treatment, particularly dietetic, in those having a hereditary predisposition, and further advocated the following:

1. The Alpha and Omega in the care of diabetes is dietetic treatment, and not drugs.
2. It must be known that diabetic glycosuria increases with time, while the tolerance of the patient decreases.
3. When the diabetic is sugar free, his tolerance usually increases. Therefore, aim to render the patient sugar free and keep him thus.
4. Limitation of the total diet with resulting disencumbrance of the entire metabolism brings about a favorable result.
5. Reduction of carbohydrates and of proteins for the removal of glycosuria.
6. Sugar-producing foods are the carbohydrates and proteins.
7. We should determine the exact qualitative and quantitative diet for every diabetic who comes under treatment.
8. Patients get along well on 30-35 calories per kilo body weight.
9. Sugar production from fat does not play such an important role as to influence diabetic glycosuria to any notable extent.
10. For this reason, and on account of its high caloric value, fat is the most valuable food substance for the diabetic.

A mere glance at the preceding dicta of Naunyn makes it obvious that his concept of diabetes was all inclusive and of the best, up to his time. Today, however, since the advent of insulin, Naunyn's tenth commandment must be set aside. It is not true that fat is the most valuable food substance for the diabetic. My own belief is that if Naunyn had reduced the total food intake and given his diabetic patient a diet of carbohydrate, protein and fat in nearly normal proportions, at least 40% of his patients would have been better off than they were on the high fat diet. We know now that 40% of our patients do not require insulin and that they can be well controlled on a moderate carbohydrate and low fat diet. Given a high fat diet, these patients like the other 60% tend to develop ketosis and coma. It is my belief that the high fat diet was responsible for many cases of avoidable diabetic coma, and higher mortality.

The following table shows our experience in that respect:

DIET AND KETOSIS

Year	Patients	Carb	Fat	Insulin	Ketosis
1923	100	Low	High	0	43%
1932	100	High	Low	0	2%
1942	706	High	Low	65%	4%

Fasting: Guelpa, of Paris, in 1896 began the treatment of diabetes with periodic fasting. This was advised as a measure to "disintoxicate" the diabetic patient. It should be recalled here, that Bouchardat, half a century before, advised fast days in the treatment of diabetes. Guelpa demonstrated that by fasting and the use of saline laxatives, the patient is made sugar free usually in three days. In 1910, he presented his results before the British Medical Association. Working with Robin at the Beaujon Hospital in Paris, he had demonstrated the effects of fasting in severe cases of diabetes, finally winning the approval of the most skeptic ones about him. Said Bardet, "Guelpa has done something both new and of great significance." Fasting was less quickly adopted in America, because at this time Benedict, Mendel, and others were claiming, and rightly so, that fasting increases ketosis, thus inviting diabetic coma, and is therefore dangerous.

An American, Woodyat, in 1909 wrote of semi-starvation periods of one to five days in the treatment of diabetes. Allen and Joslin further developed the fasting treatment.

The Pancreas: Vassale in 1889 ligated the duct of Wirsung, noted that atrophy of the acinous tissue in the pancreas followed, that no changes occurred in the Islands of Langerhans, and that glycosuria was not produced. Therefore, he argued, the function of the Islands of Langerhans was apart from that of the acinous tissue.

Lepine in 1892 believed that in diabetes the pancreas fails to produce the required ferment or internal secretion necessary for health. Williamson in 1894 suggested implantation of living pancreas. Sandby in 1894 suggested that a fresh extract of pancreas be injected, thereby hoping to replace the needed pancreatic ferment. Sir E. Sharpley Schafer in 1895 suggested that pathological changes in the Islands of Langerhans may be responsible for diabetes.

In America, Opie in 1900 elaborated the idea that diabetes was a disease due to degeneration of the Islands of Langerhans in the pancreas, that these islands had an internal secretion, and alteration of form and function in these structures resulted in diabetes, and that the acini of the pancreas were not involved.

Zuelzer, Dohrn, and Marxer (1906-8) prepared an extract from expressed juice of the pancreas, treating it with alcohol and dissolving the residue in salt solution or water. They noted favorable effects of this extract on the hyperglycemia of depancreatized dogs and also on the ketonuria of diabetes, and treated eight cases of human diabetes and four cases of ketosis with favorable results. The difficulty with their extract was its impurity, which after injection produced shivering, chills, and fever. Says Macleod, in whose laboratory insulin was produced by Banting and Best, "There can be no doubt that Zuelzer in 1908 came very near to isolating what we now call insulin."

Ssobolew and Schulze, working independently in 1902, found that after ligation of the excretory ducts of the pancreas, acinous tissue gradually undergoes atrophy, while the Islands of Langerhans remain intact. Their experiments also showed that withholding from the intestine the external pancreatic secretion, pancreatic juice, did not produce glycosuria. They further proposed that if an extract of the Islands, obtained from the new-born calf, could be isolated, such organotherapy might be effective in the treatment of diabetes.

In Italy, Massaglia experimentally proved, in 1912, that destruction of the Islands of Langerhans does result in glycosuria. He also believed that an internal secretion of the pancreas governed carbohydrate metabolism, and attempted the treatment of diabetes with a pancreatic extract.

Many other experimenters also believed that the pancreas manufactured such an internal secretion. Renne and Fraser, as early as 1907, prepared an extract of pancreatic tissue containing Islands of Langerhans taken from fish. This was administered to animals with diabetes, but the results were inconclusive. Falta in 1915, fully believed that such an internal secretion or hormone existed. Von Furth, Von Noorden, and Naunyn were convinced of its existence, and all of them believed that sooner or later such a substance would be demonstrated.

The work of Opie in 1900 has already been discussed. Allen in 1913, after surveying the field of diabetes and glycosuria in his outstanding monograph, defined diabetes mellitus as "the condition resulting from a reduction of the pancreatic amboceptor below the requirement of normal metabolism."

Banting-Best and Insulin: Moses Barron repeated the experimental work of Ssobelow and Schulze (1902) and obtained results similar to theirs. It now appears that this physiological experiment was the key that finally opened the way to the discovery of insulin. The hypothesis underlying the experimental research of Banting, was, according to his own writings, formulated in November, 1920, after he had read a report of Barron's work on the relation of the Islands of Langerhans to diabetes. Barron found that after ligating the excretory ducts of the pancreas the acinous tissue gradually atrophies while the Islands of Langerhans remain intact. This being so, said Banting, an active extract of the tissue of the Island of Langerhans, which should be an effective glycolytic agent, might therefore be prepared. A subsidiary hypothesis was that trypsinogen, the secretion of the acini, and at the

same time the external secretion of the pancreas, was antagonistic to the internal secretion of the pancreas. This, he said, accounts for the previous failures following the use of extracts of the whole gland.

Banting's work began in November, 1920, in the laboratory of Professor Macleod, University of Toronto, Canada. Associated with him were Best, a graduate assistant in the Department of Physiology, and later, Collip, a biochemist.

On May 17, 1921, Banting and Best began their collaborations. Macleod asked Best to work with Banting. For the following four or five months they worked uninterruptedly and alone. On November 14, 1921, Banting and Best made their first report in Toronto. In December, they made the second report before the American Physiological Society at New Haven, Connecticut. By May, 1922, the importance and possibilities of his extract, isletin, now known as insulin, seemed very definite. After the injection of insulin subcutaneously or intravenously, blood sugar fell progressively from the normal to a low level, depending on the dose. After the primary fall, blood sugar gradually returns to normal. If the dose is sufficiently large, blood sugar may fall to a level as low as 45 mg. per 100 cc., at which time the animal develops certain alarming symptoms, the symptoms of hyopglycemia, also spoken of as insulin reaction or insulin shock. These hypoglycemic manifestations disappear promptly upon the administration of glucose. Clinical application of the use of insulin was made by Campbell and Fletcher in the clinic of Graham, Toronto General Hospital. Thus it was that insulin came into existence.

Insulin Today

THE question now is, where do we stand today? We have regular insulin which acts for approximately six to eight hours after injection. We have the protamine zinc insulin of Hagedorn which becomes active in six hours and carries over for 16-24 hours and globin insulin, which becomes active about two hours after it is given and continues for about 15 hours. This duration of activity depends upon the vehicle in which the insulin molecule is suspended and the rate at which it is absorbed. In any and all of the insulins, the metabolic value of a single unit of insulin is precisely the same; the difference being in duration of its metabolic activity.

Diet Today

IN SO FAR as diet is concerned, the aim is to give the patient a maintenance diet, one to maintain him in a healthy nutritional state, avoiding obesity, and avoiding undernutrition and deficiencies.

We seek optimal values in food given to the patient, and we aim to have that food metabolized in a normal way by compensating for the patient's insulin deficit, with the insulin that is administered by injection.

What of the Future? The following table indicates what has been accomplished in the treatment of diabetes over the past 27 years.

DIABETES—FAIT ACCOMPLI

			1922	1949
Diabetic coma	Mortality	approx.	50%	2%
Diabetic gangrene	Incidence	"	20%	3%
Diabetic surgery	Mortality	"	High	Normal
Pregnancy	Mater death	"	45%	0
	Foetal death	"	50%	3%
Life span in adults			At least	75% normal
Life span in children			at age 10,	40 years
Surviving	20 yrs. or longer	"	1.8%	24.1%
Employability	Before insulin era, greatly restricted.			Near Normal

If a comparable showing can be made over the next quarter century, and this seems almost too much to hope for, then diabetes could become a problem of minor importance. The problems are still very large, but history has shown that the future is always charged with the unexpected, and things which are near magic, somehow seem to turn up when least expected.

What Do We Ask of the Future?

WE WANT to know what is an ideal diet for man, as to the proper amounts and proportions of carbohydrate, protein, and fat.

2. We suspect that arteriosclerosis, the deadly scourge of our time, because of its fat-containing lesions, may have a nutritional basis, and the great question is, what is the mechanism of its production and what can be done to prevent it?

3. Since diabetes, according to our present day concepts is brought about largely by hormonal imbalance between the pituitary, thyroid and adrenal on one side and the pancreas with its insulin on the other, and because these two sets of hormones have "antagonistic" actions, what we would like to be able to do is to restore normal balance and thus normal metabolism which undoubtedly would lead to diabetes control.

And so, we have reviewed, or glossed over, in less than an hour, at more than rocket speed, some 3500 years of medical history, of man's effort in the search for comfort, health, and life. Much has been accomplished; and there is yet much more to be done. But we are not dismayed; we do not feel as did Sir William Gull (1860-1890), notable in his day for medical achievement, and physician to Queen Victoria. On listening to a greatly detailed report by Pavy, who had devoted 20 years to the study of diabetes, he was annoyed by the intricacy and detail of Pavy's studies. In a public meeting, he deprecated Pavy, saying with some petulance, "I wonder what sin Pavy has committed or his fathers before him, that he should be condemned to spend his life seeking a cure for an incurable disease." In 1923, Sir William's wondering found its answer, and in unmistakable fashion the answer was insulin, Banting and Best. The lesson all of us in medicine would do well to take from this is that tomorrow will be even better than today.

Social and Economic Implications of Diabetes

A. V. MURRAY,
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Pittsburgh

IT IS QUITE appropriate that this first Seminar on Diabetes in Industry, which is open to local representatives of the medical profession, should be held in Pittsburgh. Probably at no place in the country are more people—medical, industrial, labor, the general public—more conscious of both industrial and public health and safety. Our heavy industries and mining operations are by nature among the most hazardous. Smoke, the Donora smog, and stream pollution have made Pittsburghers acutely conscious of the health hazards from those sources. Many organizations and groups have concentrated upon the elimination of those hazards. Foremost among these is this Industrial Hygiene Foundation which has made valuable contributions to corrective programs.

Our educational institutions are alive to the increased demands being made upon the medical profession by the establishment of the School of Public Health and the enlargement and modernization of the Medical School at the University of Pittsburgh. In these forward steps, Pittsburgh has more than laid the groundwork to attain the eminence in medical education that it has previously attained in its major industries. The fact that you doctors, all busy men, are taking the time to attend this Seminar is evidence of your practice of keeping abreast of the most modern developments in every phase of your profession in order better to serve the public. Such an atmosphere encourages, perhaps almost guarantees, the full cooperation of industry not only in a program for diabetics in industry, but for any sound health or safety program.

THE subject assigned to me is "The Social and Economic Implications of Diabetes." It is my opinion that unless a substantial portion of our population should actively become diabetic, the social and economic implications of diabetes cannot be classed as being very serious, at least to industry. Certainly they are minor in comparison with the problems incident to the employment of people having crippling handicaps.

Diabetes causes no physical disfigurement or impairment which might be distasteful or objectionable to fellow employees. No physical help is required for diabetics to move from place to place. They require no physical aids or special equipment such as are necessary when sight or use of limbs is impaired. In fact, there are indications that some diabetics, conscious of their handicap, take their jobs more seriously, and are therefore better employees.

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The special considerations which must be given to a known diabetic are relatively minor. Working schedules must be regular in order to permit them the regularity of diet and activity which is usually prescribed. Extra precautions must be taken or additional safeguards provided to minimize the risk of injury or infection. The job assignment usually accomplishes this. In case of injury or infection, adequate medical care must be readily available and close attention must be given until the patient is fully recovered. Fellow workers should be alerted to the possibility of coma or insulin reaction in diabetics.

The medical profession can be justifiably proud of its outstanding accomplishment in so effectively controlling the disease to the extent that, according to Metropolitan Life Insurance Company's booklet on diabetes, "the diabetic who studies his disease and uses his knowledge to cooperate intelligently with his physician stands a good chance of living as long and as successfully with diabetes as he might reasonably have expected to live without it."

IT WOULD appear that in so far as the disease itself is concerned, the problems of industry in connection with the employment of the diabetic are comparatively simple. This might be true if diabetes were the only handicap to be considered or if only handicapped employees needed to be considered. Today the non-handicapped must be considered also. Broadened social insurance and pension programs are the result. All of these programs result in added costs to a company. Regardless of the sympathy or desire to help which the management of a company may have toward the illnesses or problems of its employees, the management must consider the cost. Management's primary job is to operate a business successfully. To do that, it must be operated at a profit. To operate it at a profit, goods or services must be sold for more than it costs to procure those goods or services. Selling prices are limited by competition unless the company has a monopoly. Costs, all costs, must be kept to a minimum. Bear in mind that the management —and the management alone—bears the full responsibility for making the profit; everyone else either wants a larger slice of it or complains that it is too high.

Social insurance is one of the several so-called "non-wage labor costs," the burden of which upon industry has been increasing steadily in recent years.

In our own company these non-wage costs have increased 80% in the past six years while direct wage costs have increased 55% during the same period.

WHAT are these non-wage labor costs and how serious are they? In 1949, the United States Chamber of Commerce published a research study entitled, "The Hidden Payroll, Non-Wage Labor Costs of Doing Business," conducted by its economic research department. The study covered 203 representative firms employing more than 2,100,000 workers. There was a wide variance in the information reported by each firm, however, the following summary was taken from the averages compiled from the reports of all firms:

Description	Percent of Wages Paid For Time Worked	Cents Per Hour Worked	Dollars Per Year Per Employee
1. Legally required payments for Old Age Benefits, Unemployment Compensation, Workmen's Compensation	3.2%	4.3¢	$88.
2. Pension plan premiums and pension payments not covered by insurance-type plan	2.2%	2.9¢	61.
3. Social insurance (life, sickness, accident, hospitalization, medical care, etc.)	1.4%	1.9¢	39.
4. Termination pay, discounts on purchases, free meals, etc.	.9%	1.2¢	24.
5. Paid rest, lunch, travel and make-ready periods	1.8%	2.4¢	50.
6. Payments for time not worked, vacations, holidays, miscellaneous	4.8%	6.4¢	132.
7. Profit sharing, bonuses, etc.	1.1%	1.4¢	30.
TOTALS	15.4%	20.5¢	$424.

An increase of 2.1 cents per hour for social insurance and 3.1 cents per hour for pensions, to meet the so-called package requirements of 4 cents and 6 cents respectively recommended by the President's Fact-Finding Board, would increase the above average non-wage payments to $532 per employee per year. In our own case, an increase to 10 cents per hour worked in the amount spent for social insurance and pensions would represent an additional increase of about 80% in our non-wage costs which is equal to approximately 30% of our profit for 1949.

Why be concerned if these additional costs will be passed on ultimately to the man in the street —to you and me? If all of the increase could be passed on immediately and you and I did not refuse to pay the increased costs, there would be no problem. Unfortunately, an attempt to pass on the increased costs by increasing selling prices will, in many instances, result in a loss of business because some concern may be selling the items for less. Fortunately or unfortunately, all companies producing a similar item do not produce it in the same way or at the same cost; processes differ, costs and types of equipment differ, wage rates differ, costs of raw materials differ, and so on, all of which results in a wide variance of costs. It is obvious that these differences cannot be corrected overnight or that enough capital could be made available to finance them even if they could be corrected overnight.

What then is the outcome? There are several possibilities, all of which may adversely affect the number of jobs available not only for the handicapped but also for the non-handicapped. Some companies, in order to survive, may have to resort to one or more of these possibilities, a few of which I am going to outline.

The cost to a company of insurance, such as unemployment compensation, workmen's compensation, life, health and the like, is determined by experience. The higher the amount paid out as benefits, the higher the cost. In order to hold costs to a minimum, it may necessitate a more careful screening job in order to choose applicants who might be less liable or less susceptible to illness or to injury. Such a screening probably would make less jobs available to applicants already handicapped. In view of the constantly increasing burden of wage and non-wage labor costs, it is reasonable for the employer to expect maximum efficiency and productivity from his employees. This may limit the employment of the handicapped in some lines and in some companies. Low stamina, above average absences from the job, as well as lack of skill, may be sufficient to disqualify an applicant for a job.

Again, the constantly increasing wage and non-wage labor costs may force a company to resort to labor saving equipment where capital is available. The recent additional costs resulting from expanded social insurance and pension programs, the latter compared to depreciation on equipment, may, in the comparison of the cost of labor versus the cost of equipment, tip the scales in favor of the latter. This might mean less jobs if it were not offset by increased markets.

By the foregoing, I do not wish to convey the impression that I foresee a replacement of men with machines or that there will be no place in industry for the diabetic or other handicapped individual. I do want to draw attention to the fact, however, that each new burden of increased costs placed upon industry necessitates some readjustment. In view of the lowered demand for practically all goods now that war shortages are satisfied, the readjustments may be more severe and more far reaching. The readjustment may be drastic for some companies, some communities, some families or some individuals both from a time and a severity standpoint. It may cause a set-back in programs for the employment of diabetics in some areas and some companies, particularly in the smaller companies which do not have their own medical service departments.

IT IS WITH such smaller companies that much can be accomplished for the benefit of the diabetic and other handicapped persons by the doctors in this audience who are in private practice. Many of you number among your patients the owners and managers, as well as the employees of the smaller companies. To the owners and managers you can readily explain the comparatively simple precautions necessary for the successful employment of the diabetic. You can allay the fears that they might be adding to their bur-

dens by employing or retaining a diabetic. To the employee patient suffering from diabetes, you can add another incentive for him to follow conscientiously the program of treatment, and that is to avoid becoming or being considered the burden that the management fears.

As I mentioned before, industry will cooperate to the fullest extent in the medical profession's program directed both towards the identification of diabetics and their successful employment in industry. Much of that program will be brought out in the talks of the eminent and capable medical and lay authorities who are participating in this Seminar. The medical profession's marvelous record in this connection entitles it to that support and cooperation. Let the good work be continued. It is both an inspiration and a challenge to other research activities.

Teamwork versus Prejudice

A 30 YEAR-OLD coal miner, the father of a nine-year-old girl, sustained a fractured spine and complete paralysis of both extremities below the waist. He developed such extensive bed sores that it was necessary to amputate both legs close to his hips. He also developed stones in both ureters which were unsuccessfully operated on, leaving him with a draining abdominal urinary fistula. Today this young man, despite his paraplegia, bed sores, urinary fistula and bilateral high-thigh amputation, walks with the aid of artificial limbs, all wounds healed, his fistula closed and the stones removed from both ureters. Teamwork did this. The neurosurgeon, the urologic surgeon, the orthopedic surgeon, and the plastic surgeon all worked together. This is the basic principle in the treatment of the severely disabled. But of special significance is the fact that special facilities were provided in a rehabilitation center for the adaptation of this miner to the routine pursuits of life. Surgery is not enough for the amputee. The surgeon must work cooperatively with the limb maker, the physical therapist, the occupational therapist, the vocational counselor, the training officer. All their energies must be directed toward a fixed program including complete psychological and physical restoration of the patient, his vocational guidance and training, and his final placement in work consistent with his capacities. This integrated program which forms the basis of rehabilitation can well be applied to all sick and injured, and should replace the old concept of cure. A man is not cured unless he reaches the maximum physical, mental, vocational, and social usefulness. The rehabilitation center provides not only the facilities but the professional and social climate to effect these results .... The greatest obstacle to the rehabilitation of the physically handicapped is public prejudice. The fundamental and deep-seated aversion is so insidious and powerful that many outwardly sympathetic persons do not realize the basis for their inwardly truculent attitudes. Rationalization appears on all sides. Is there no way we can change this public attitude? Can we not demonstrate the value and effectiveness of these crippled and disabled persons? Can we not make reasonable people understand the role they play in our national and international life?—that we have underestimated the potentialities of our physically handicapped population; that we have neglected them as an indispensable reserve of manpower; that we have overlooked the possibilities of these human resources and how they can be increased by the technics and processes of rehabilitation; that we have ignored the great spiritual forces unleashed in the act of restoring the crippled and disabled to independence and economic security .... Twenty-five years of organized effort on behalf of the disabled have produced only limited results. The war periods were favorable, not because of a change of attitude, but because of need. Certainly we must continue the struggle against this monster of prejudice. Certainly we must arouse the general public and the professions to their responsibilities. But fundamentally and in the final analysis, they cannot be trusted. There is only one hope for the disabled—rehabilitation. Train them and develop them so that they can stand on their own. Provide them with physical and vocational equipment that will enable them to face the challenge of competition. It was Balzac who said that most of us are just ordinary people seeking extraordinary destinies. The physically handicapped are extraordinary in that they seek only an ordinary destiny. This, then, is their challenge to us. Give us the opportunity to realize that destiny.

—From the Statement submitted by DR. HENRY H. KESSLER, Director, Kessler Institute for Rehabilitation, on behalf of the A.M.A., before a Sub-Committee of the Senate Labor and Public Welfare Committee, May 5, at a hearing on certain bills for rehabilitation of the handicapped.

Detection of Diabetes in Industrial Workers

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APPROXIMATELY 75% of the 2,000,000 diabetics in this country are over 40 years of age. Of these the great majority are between 40 and 65. This fact makes the diabetes problem of particular importance in industry since it is in this age group that the skilled, experienced, key employees are to be found. This age period includes the most valuable part of the worker's life when the existence of a hidden, untreated, chronic condition, such as diabetes, may have serious effects upon his working efficiency. As an example, among machinists and tool-makers impairment of vision by untreated diabetes might terminate a man's work at his highest productive level. Our objective then is the prolongation of the worker's efficiency by preventing avoidable diabetic symptoms and complications.

These considerations led me to search for information about the industrial population of this country from the publications of the U. S. Public Health Service, and the National Association of Manufacturers, and from articles in INDUSTRIAL MEDICINE. I learned that during the week December 6-11, 1948, the working population in this country was at a high level. Actually at that time there were 7,375,000 persons employed in agriculture, of whom more than 6,000,000 were male. In the non-agricultural industries a total of 52,059,000 persons were employed: 35,991,000 male and 16,068,000 female. Next I was concerned to know how many of this large industrial population were employed in industries where a well organized medical service might be already carrying on such a medical program as would detect diabetes. In a study of "Wartime Industrial Medical Services" by Brinton, Dreessen and Trasko, in INDUSTRIAL MEDICINE, August, 1943, it appeared that in 962 establishments only 18% had one or more full-time physicians. In plants with less than 250 employees no full-time physicians were found, and with plants between 250 and 500 civilians less than 1% had a full-time physician. However, physicians on call for emergencies and first aid were available in from 62 to 75% of plants with less than 500 employees. When the number of employees rose from 500 to 10,000 or more the percentage of plants employing full-time physicians increased. Naturally, as the percentage with full-time physicians rose, the percentage with on-call or part-time physicians fell. I was also informed that 90% of all commercial and industrial firms have less than 500 employees.

In the report of a survey of 2,064 industrial establishments issued by the National Association of Manufacturers in 1941 a careful study of the features of factory health programs was made. All of the companies selected for survey had some type of factory health program. Twenty-three separate items, such as provision of restrooms, were listed in the questionnaire which went to the factory. Maintenance of a doctor or registered nurse in the plant at regular hours, nevertheless, occurred in only 13% of those plants having under 250 employees. For the group as a whole including the large factories with 10,000 to 20,000 employees 32% maintained a doctor and 42% a registered nurse. It seems clear, however, that since more than 70% of all workers are employed by firms having less than 500 employees and since only 21% of the factories surveyed by the National Association of Manufacturers offered periodic health examinations of office employees, the problem of diabetes among industrial workers must be an open and challenging field for investigation. A real need exists for a cooperative effort to find and treat hidden diabetics and to study the working efficiency of diabetics.

The importance of diabetes detection stems from the nature of diabetes itself. We are accustomed, if I may review for a moment our medical ideas, to regard diabetes as a constitutional disease on an hereditary basis characterized by the presence of glucose in the urine and persistent hyperglycemia. It is due to disease of the pancreas and may be associated with disturbances in liver function and in other endocrine glands. For many years intensive study has been given to the various factors which may enter into the etiology of the disease such as the role played by the pituitary, the thyroid, the adrenal glands. In recent years investigations of these glands and of experimental diabetes produced by such substances as alloxan have contributed to our knowledge. However, at present among the most competent experimenters and clinical observers diabetes is defined as hypoinsulinism. Therefore, diabetes whenever diagnosed by the presence of glycosuria and elevated blood sugar level is essentially a deficiency disease and it is the lack of sufficient insulin which fundamentally explains the symptoms and the characteristic features of the disease.

Incidence of Diabetes

BEGINNING with the studies of the Massachusetts Department of Health more than 20 years ago and continuing with the survey of the National Health Institute, evidence has steadily accumulated indicating that the frequency of

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diabetes in the community is much greater than had previously been thought. It was long known that diabetes as a cause of death in mortality tables had risen rapidly from 27th to 9th place in the last 50 years. However, evidence accumulated that estimations of diabetes morbidity based on mortality tables erred grossly by understatement. In Massachusetts, Lombard and Joslin showed the error. When careful studies of various groups began to be made by means of blood sugar tests as well as urine tests, the frequency of diabetes and the possibility of detecting diabetes in any early stage before symptoms had occurred became evident. Such surveys of the draftees in induction centers in Boston during the war and in such communities as Oxford, Massachusetts, by the U. S. Public Health Service, as well as the earlier survey in the state of Arizona in 1940 clearly show that diabetes is a universal disease and that it can be discovered in an early stage. Its frequency is indicated by the demonstration through these surveys that there are probably a million people in the country with diabetes who are already diagnosed, but in addition one million patients exist with unrecognized or hidden diabetes. Although the recognized, treated, and controlled diabetic is not a major problem, it is the unknown and therefore untreated diabetic who presents the problems of physical impairment and hazards in employment.

Reasons for Discovering Diabetes in an Early Stage

ALL STUDENTS of diabetes have agreed upon the tremendous importance of the recognition of diabetes in an early stage before symptoms and complications have developed. As an illustration a young man 27 years of age was found in a Diabetes Detection survey in early acidosis which might have become coma in 48 hours. However, the importance of early diagnosis has been more clearly brought out by analysis, particularly of the patients of the George F. Baker Clinic, through the Statistical Bureau of the Metropolitan Life Insurance Company more than a year ago at the American Medical Association's exhibit in Chicago. In this analysis the mortality rate for diabetic patients discovered before symptoms or complications had developed was only one-third of the mortality rate of diabetic patients whose disease was not discovered until symptoms had occurred. It was these facts that led the American Diabetes Association, in June, 1948, to appoint a Committee on Diabetes Detection.

Diabetes Detection Program

THE first attempt was made in an experimental fashion to carry out the beginning of a Diabetes Detection program in various communities during Diabetes Week in December, 1948. This Diabetes Week received a moderate amount of publicity and the active cooperation in many cities both of the doctors in Diabetes Associations and of the county medical societies. A partial report of the tests made indicated that among the first 148,000 people tested among adults about 1% proved to be new cases of diabetes; among the children tested roughly one in 2,000 may be discovered to have diabetes.

The interest of industry in diabetes detection was demonstrated in many communities such as Worcester, Massachusetts, Dayton, Ohio, and St. Louis, Missouri. In many industries where a full-time medical program was in action, interest in diabetes had been increasing for many years. Actually in Dayton, more than 25,000 persons in industry were tested during the Diabetes Detection program of last year, and that program is continuing all year-round as had been planned. This year a much larger number of industries have undertaken detection programs. If I may quote an example, in Massachusetts the Executive Office of the Associated Industries of Massachusetts announced the Diabetes Detection program and in 233 industries plans were made for offering urine tests to employees. Actually the degree of cooperation seems to vary considerably in different industries. In certain industries the employees have not understood the intention of management, and have feared that the discovery of glycosuria or diabetes might lead to loss of their work or at least transfer to some less lucrative position. Cooperation has been withheld so that in one instance out of 2500 employees only 25 volunteered for testing. In direct contrast with this attitude was the experience in Dayton, Ohio, where in preparing for the detection program preliminary explanation of the purpose of the program to the union representatives brought about a high degree of cooperation with management. Both recognized the advantage to the health of the worker in the avoidance of illness and absenteeism.

In general, as we received reports from various communities since this year's Diabetes Week began the diabetes program for the year, October 10-16, there is a steadily increasing activity among industrial physicians, and an increasing cooperation in carrying out the program for diabetes detection.

In Massachusetts among industries which responded to a single letter sent out by Associated Industries of Massachusetts there are 35 industries which employ full-time medical personnel; in another 33 industries part-time medical personnel is employed and in 51 the plants have no regular medical personnel and would rely on local physicians to carry out programs. In the fourth group of 31 industries no suggestion was made about use of a local family physician, but in this group many of the plants have planned to use the new self-testing equipment as a trial. In many cases the detection program is continuing so that so far no more than a preliminary statement can be made.

However, in the first 50 industries reporting, again the percentage of new patients found varies from 0.5 to 1.5%.

Results of Routine Examinations

THE detection of diabetes does occur in the course of routine examinations, of pre-placement examinations, as part of periodic examinations of employed persons and in transfer examinations, and finally in general health examinations. The attitude of our Diabetes Detection Committee has been expressed as follows: The best way to detect diabetes is to have a urine and blood test as part of a general health examination carried on at regular periods, perhaps every six months or every year. Such a general health examination should be encouraged in industry as among all the citizens of the country. In pre-placement examinations diabetes has been found not infrequently as noted in a forthcoming article by Dr. Gordon M. Hemmet, Medical Director of the Hawk-Eye Works, Eastman Kodak Company, Rochester, New York, which he has made available to me, and in which there is a summary of 10,157 pre-employment medical examinations during the years 1943 to 1947. In summarizing this survey, 30 known diabetics were found and 26 unknown diabetics, making an over-all incidence of unknown diabetes in one person out of 391. It is important to remember that 50% of these examinations were between 18 and 35 years of age where the incidence of diabetes would be expected to be low as compared with the age period of 50 to 65 years. The author points out that the incidence might have been higher had they used routine blood sugar tests in all applicants. However, they did blood sugar tests and even dextrose tolerance tests on those patients who showed glycosuria, and in cases where suspicion was otherwise aroused. One of the first studies of the diagnosis of undetected diabetes in industry was carried out by Dr. Edward W. Gates, Medical Section, E. I. du Pont de Nemours & Company, Niagara Falls, and reported in INDUSTRIAL MEDICINE, August, 1942. Dr. Gates studied 1800 employees. In this plant among 1800 individuals who for years had careful annual physical examinations, eight gave a family history of diabetes, 63 had an hereditary history of diabetes, 46 showed sugar in the urine, and eight were known to have diabetes. Glucose tolerance tests were carried out on all those with a family or hereditary history of diabetes, and also on those who showed sugar in the urine. Thirteen per cent of the 63 persons who had had a hereditary history of diabetes were found to have diabetes. In the group as a whole he concluded that the incidence of diabetes was far greater than had been expected. An important point in his report is that all of the obese and potential diabetics were put on dietary treatment and some lost as much as 40 pounds. It must not be forgotten, that the main objective in the detection of diabetes is the initiation of early, effective, and adequate treatment. This need not mean in every case the use of insulin, but a most important preventive measure is the recognition of borderline cases and particularly those patients who have an hereditary history of diabetes, and the initiation of treatment designed to reduce obesity, and so to control one of the best known etiologic factors in the production of diabetes.

The Types of Examination for Diabetes Detection

THE clinical detection of diabetes on the basis of signs and symptoms must always be borne in mind, although the basic fact is that by the time the ordinary signs and symptoms of diabetes have developed the disease has probably been in existence not merely for months, but in middle life often for five to 10 years. The tragedy we encounter frequently in the hospital is the group of patients who come late for treatment when they have diabetic retinitis, gangrene, serious loss of vision, or impending amputation when it is perfectly evident that diabetes has been present for from five to 10 years. Symptoms that may bring patients to the dispensary are loss of weight or strength or merely a feeling of exhaustion and lassitude, and in all such patients tests of the urine and blood at an interval of one hour after a meal containing a good deal of carbohydrates should be carried out in preference to the use of fasting specimens of blood or urine. The classical symptoms of frequent urination, increased thirst, blurred vision, drowsiness, and dysuria will always lead to urine tests. Less common symptoms but still frequent, to suggest a search for diabetes, are pain in the back and pain in the leg which may be diabetic neuritis. Pain in the leg may be noted on walking or, more frequently, pain and cramps at night which disturb sleep. Almost any disturbance in vision, and particularly the repeated and slowly healing lesions of the skin or extremities should be regarded as symptoms. Skin lesions include pruritus vulvae balanitis in the male, and especially the rare lesion known as necrobiosis lipoidica diabetica. Other conditions not usually associated with diabetes but important to remember are bursitis or periarthritis of the shoulder and Dupuytren's contractures which are commonly found in diabetic patients of long duration particularly in middle life. Drowsiness and unconsciousness are emergencies always requiring the doctor to bear in mind the extreme importance of differentiating diabetic acidosis or early coma from hypoglycemia of the patient who may have concealed his diabetes but is nevertheless taking insulin in large or incorrect doses. Perhaps the worst mistake in all internal medicine is to give to a person found unconscious a dose of insulin thinking that the person has diabetic acidosis when in reality he is suffering from hypoglycemia from a previous dose of insulin. For some reason extra insulin given under these circumstances has the potentiality of causing permanent damage to the central nervous system if not death itself.

Diabetic acidosis really begins gradually. A period of several days of nausea, vomiting, constipation, abdominal pains, and increasing difficulty in breathing usually leads the patient or

the family to a doctor's office. However, there are a good many diabetic patients in whom coma comes on fairly rapidly and who actually are found unconscious in a rooming house after many hours of unconsciousness. Hypoglycemia on the other hand develops rapidly. The person who left home apparently perfectly well, fairly suddenly late in the morning or in the afternoon may become unconscious or show convulsions. In this patient, in contrast to the acidosis patient, the skin is moist, the blood pressure may be normal or elevated, pulse is rapid, reflexes are hyperactive. Fortunately such clinical emergencies are comparatively rare, although when they occur the occasion is urgent.

Laboratory tests for the diagnosis of diabetes stress the fact that the finding of a reducing substance in the urine must be followed by a demonstration that the substance is really glucose and not one of the rarer sugars such as levulose or pentose. Interpretation of the blood sugar test which must always follow the finding of sugar in the urine will depend somewhat on the methods of blood sugar analysis used. Up to the present, methods such as the Folin-Wu or Benedict method give slightly higher values than other methods for the reason that they determine not only the true glucose of the blood but also other reducing substances which may vary in amount from as little as 20 mg. to as much as 80 mg. per 100 cc. Newer methods, such as the Nelson modification of the Somogyi method, determine true glucose only. Thus the last-named method gives normal blood sugar values from 70 to 90 mg. per 100 cc., whereas with the Folin-Wu method values from 80 to 130 mg. fasting are usually considered normal. After food or after glucose in the glucose tolerance test interpretations do vary. However, many clinicians make a diagnosis if glucose is found in the urine and the blood sugar exceeds 170 mg. from the venous blood at any time within an hour or two after a meal containing carbohydrates or after glucose in a glucose tolerance test. Other clinicians consider that the height of the blood sugar is of less importance than the duration of the elevation and therefore they consider the level of the blood sugar at the end of two hours as more important. To make it more difficult one may use capillary blood instead of venous blood. In capillary blood differences from 30-80 mg. are also occasionally seen, arterial or capillary blood being higher venous blood.

The following outline for establishing a Diabetes Detection program is offered for criticisms and suggestions:

American Diabetes Association, Inc.

Diabetes Detection Drive

SUGGESTIONS FOR ESTABLISHING A DIABETES DETECTION PROGRAM IN INDUSTRY:

Purpose of the Diabetes Detection Drive: The purpose of the Drive, in brief, is to find the estimated one million unknown diabetics in this country and to bring them under adequate medical treatment and proper management of the disease. Earlier detection of diabetes and instruction of the patient in the knowledge of his condition and the best methods of treatment will improve his working efficiency and prevent absenteeism.

Industry's Role: It is desirable to examine as large a number of people as possible within a given area. Industry affords an unusual medium in which to screen for diabetes a great many people with a minimum expenditure of time, effort and money. Industrial workers lead active and productive lives and their efficiency may be seriously affected by a hidden and untreated chronic disease.

I. *Persons to be Tested:* All employees should be tested annually regardless of age or sex. Diabetes, however, will be found five to seven times as often in individuals with known diabetic relatives. In one industry diabetes was found in 13% of the employees who knew of diabetes in their families. Diabetes may occur at any age, but is more frequently found after the age of 40 and among the obese. Incidence of the disease is nearly twice as high among women. Ten per cent of those with glycosuria who are at present not found to be diabetic will subsequently develop true diabetes.

II. *Place of Testing:* If available, the company's medical facilities, such as a laboratory, doctor's or nurse's office, first-aid station, etc., may be used. Testing, however, also can be carried on in the laboratory of a nearby hospital, or a local health unit, necessitating only a collection station within a plant. Home-testing is available to anyone. Equipment may be purchased at a drug store. The purchaser is instructed how to test his own urine, and to report positive tests to his own physician.

III. *Methods of Testing:* Two methods are commonly used: (A) Urine screening using well-known tests, such as Benedict, Clinitest, or Galatest. (B) Blood Sugar tests using capillary blood from either the finger tip or ear lobe. The former method (A) has been more frequently employed.

A. *Urine Testing:*

1. *Collection of Urine:* Specimens of urine should be collected by the employee in the urine bottles or small clean containers at home, or provision may be made at the plant for such collections. The specimen should be taken one or two hours after a meal containing carbohydrates in the form of potato, bread, and dessert. Urine should be voided, however, just before mealtime in order that the specimen does not contain preprandial accumulation.

2. *Methods of Urine Testing:*

(a) *Benedict Qualitative Test:* Place 2½ cc. (½ teaspoonful) of Benedict qualitative solution in a pyrex test-tube, to which four drops of urine are added. Shake tube for mixing, and then place tube in boiling water for five minutes. Apply the color comparison test to determine if test is positive (sugar in the urine) or negative (sugar not present in the urine). A cloudy green, yellow, orange or red is an indication of sugar present. A clear blue solution signifies absence of sugar. Although the test is *qualitative* basically, rough criteria have been set up for quantitative results. Generally, green means a slight amount of sugar is present, yellow implies between 1 and 2% sugar and orange or red

any amount over 2%, without determining the quantity beyond 2% present. Since the test is based on the ability of glucose to reduce copper sulfate, one may discover if the urine contains less than 2% sugar by allowing the solution to settle after boiling. A constant blue color indicates inability to reduce all the copper and therefore presence of less than 2% sugar. The Benedict *Quantitative* test may be used for an exact determination of the percentage of sugar present if desired.

(b) *Clinitest:* This procedure is based on the reduction of cupric sulfate by glucose. In the form of a tablet, it generates its own heat, obviating the external heating. With a dropper, five drops of urine are placed in a test-tube, and then when dropper is rinsed, 10 drops of water are added. A *Clinitest* tablet dropped into the tube starts the reaction. Allow tube to stand for 15 seconds after the boiling has subsided. To make interpretation of test easier, add a drop of water, shake, and compare with color scale. All shades of blue indicate negative results. Any change in color means sugar is present, but the greater the change and speed of occurrence, the higher the amount of sugar. The amount of sugar is determined by comparing the solution with the color scale at the end of the 15 seconds waiting period. If the fluid changes from various shades, green, olive, tan, orange and finally to a dark brown, the reaction is definitely positive (more than 2%).

(c) *Galatest:* Place paper toweling on tables or benches with a specimen by each toweling. Then deposit the powdered *Galatest* on paper, and with a dropper apply *one small* drop of urine on the powder. Change in color to grey or black is a positive reaction, and any other color should be disregarded.

B. *Blood Sugar Tests:*

In the past blood sugar testing has been used primarily for confirmatory diagnostic work, but with the introduction of the Wilkerson-Heftmann test, it has become practical for screening purposes. The kit, with complete instructions, is now available. Capillary blood in the amount of 0.1 cubic centimeter, taken from the finger tip or ear lobe, should be secured 30 to 90 minutes after a meal.

IV. *The Most Efficacious Detection Program:* The most accurate method of screening for diabetes is to test both urine and blood. If carrying on both is not feasible, the next best method is to screen by urinalysis and confirming positive tests only by blood sugar tests. If this is not possible, either urine testing or blood testing may be done. Urine testing is usually found less expensive and quicker. Manufacturers of several of the reagents have been providing testing material without charge for authorized detection programs.

V. *Interpretation of Tests:* Detection of sugar in the urine does not necessarily mean the individual has diabetes, since glycosuria frequently occurs in hyperthyroidism, coronary disease, peptic ulcer, carcinoma, nephritis, etc. All such persons with positive tests should be referred for further confirmatory diagnosis to their family physician or clinic. Previous surveys indicate that 3 to 5% of those tested will give positive urine tests. Facts to be taken into consideration, however, are the number of known diabetics who take the test and the increasing frequency of diabetics in the older groups. Among adults confirmatory tests have usually disclosed from 0.5 to 1.0% of the group as new diabetics.

VI. *Reports:* It is usually expeditious to have some kind of a Report Form ready which merely needs filling in by the examinee and the one giving the test. Then positive reports may be forwarded to family physicians. It is imperative that positive reports be sent out immediately in order that confirmatory diagnostic work and treatment may begin without delay.

VII. *Cooperate with the American Diabetes Association* in their aim to detect the unknown diabetic. Send a summary of your detection program to your local diabetes committee or organization and a copy to the American Diabetes Association for statistical analysis. This summary should include (1) number of individuals tested, (2) number of positive tests, (3) number of positive tests confirmed as having diabetes.

If possible it would also be helpful to have the age, sex, etc., of those tested.

"Eat Well and Lose Weight"

THE ARTICLE, "Obesity in Industry," by A. W. PENNINGTON, M.D., of Du Pont's Medical Division at Wilmington, Delaware, in INDUSTRIAL MEDICINE (18:6, 259, June, 1949) was the inspiration for an interesting "food news" story entitled "Eat Well and Lose Weight," by ELIZABETH WOODY in *Holiday* for June, 1950. The author of the *Holiday* feature describes her visit at the Du Pont Medical Division and the dramatic account given her by DR. GEORGE H. GEHRMANN, Du Pont's Medical Director, of the company's obesity-control program and its results. Referring to the subject matter of DR. PENNINGTON'S article DR. GEHRMANN says: "This pilot program was no stunt. It was carried out only after considerable thought and study. Its bases are deep in sound nutritional research. It was designed not to startle but to serve, and we have since broadened our Du Pont obesity-control program on the proved principles illustrated by its results. The diet works. It safeguards health; I'm convinced we can even say it saves lives. It boosts employee morale, it's true, but the important thing is not that it has given these overweight men and women new figures. The diet has done just that in many instances and we've been pleased to see the pride these people take in being slim once more. But we're proudest of the fact that the program may have given some of our dieters more far-reaching futures than they might otherwise have had."

Industry's Role in the Employment of the Diabetic

JOSEPH T. BEARDWOOD, JR., M.D.,
Graduate School of Medicine, University of Pennsylvania,
Philadelphia

INDUSTRY'S role in the employment of the diabetic is one of growing import. As the incidence of diabetes increases, industry should realize the ability of this particular group as workers and employees. To fill this role completely, industry must become more aware of the diabetic of 1949 .... what to expect from him as an employee and what his limitations and possibilities are.

It has been a gratifying experience to me to realize the cooperation that most industrial physicians are giving in the cases of diabetes employed in their organization. I feel that we have been remiss in not presenting to industry a clear-cut picture of what the average diabetic is like and how trustworthy he may be as an employee. Too often employers have been concerned with the belief that any diabetic may suddenly develop insulin reactions or convulsions, or may suddenly go into diabetic coma. I think it is important to realize that probably 75% of diabetics do not require more than 15 units of insulin a day and that in this large group the question of insulin reactions becomes almost an academic one.

There is every reason to believe that a well-educated and well-controlled diabetic is to all intents and purposes a normal individual as far as his activities and mode of living are concerned, except for his dietary management of his disease; therefore, it would seem that the basis on which diabetics should be employed should be the job suitability of the individual and the degree of cooperation he extends to his physician. It is our impression that the careless diabetic is also the careless workman and that the diabetic who cooperates with his program will prove to be a conscientious and dependable member of any organization.

There are obviously certain limitations or concessions for some diabetics, but these are dependent upon the individual and his previous experience and the type of work he is doing.

In the opinion of the men consulted during this survey as well as in our personal experience, the one working condition that will disturb a controlled diabetic is the necessity of working the varying eight-hour shifts, changing every three or four weeks. Most any diabetic can work any given shift if he can continue with those hours. Many can safely rotate from the 7:00 to 3:00 to the 3:00 to 11:00 period without too much change in their metabolic balance, but the so-called "graveyard shift" from 11:00 P.M. to 7:00 A.M., will cause trouble in the majority of cases. Diabetics should be restricted from certain hazardous occupations which require them to manipulate complicated machinery, such as hoists, electric cranes or structural steel work, piloting airplanes or public conveyances, where the possibility of hypoglycemia decreases the reaction time, which may cause injury to themselves or others. Hard physical work should not be injurious to the diabetic, and when you consider that fairly severe diabetics have played intercollegiate football, intercollegiate soccer and championship tennis, physical exercise in itself is beneficial. However, since such strenuous sports activities might result in injuries, particularly to the lower extremities in the long-standing diabetic, the question of development of diabetic gangrene from these accidents should be considered. We all realize that other industrial accidents or operations are little more serious in the diabetic than in the non-diabetic and that the degree of risk depends in large measure upon the status of the cardiovascular system. With the use of antibiotics and chemotherapy, infections have greatly diminished as a cause of disability in this group.

INDUSTRY'S role is undoubtedly influenced by three factors:

1. The Attitude of the Insurance Carriers.

DR. HARRY UNGERLEIDER, Medical Director of the Equitable Life Assurance Company, has permitted me to quote him. This company is one of the largest underwriters of group insurance. They make no distinction or exception for diabetics and their experiences with them in this type of insurance have been such that they feel the diabetic presents no problem. Furthermore, they have extended sickness and health insurance, including an insurance paying physician's fees, to this group and here again their experiences have been that the diabetic is as good a risk as the non-diabetic. DR. UNGERLEIDER reports that they employ diabetics as members of their organization, the only restriction being that they must be under the care of a physician.

2. The Attitude of Labor.

Labor is beginning to realize that it has a definite role in this question. In response to an inquiry directed to the American Federation of Labor, Mr. Louis Hines, for many years secretary to Mr. William Green and now a special representative, states, "The American Federation of Labor has a deep interest in the handicapped workers and their employment opportunities and this, of course, applies to the diabetic."

There is a sub-division of this organization termed "The American Federation of the Physically Handicapped," which is striving toward

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legislation in the interest of the handicapped and is putting forth special effort in behalf of the diabetic workers, realizing that many highly skilled persons may fall within this category. This organization also realizes that unless some consideration is given these people, their skills are lost and the workers deprived of earning a substantial livelihood for themselves and others. I am informed that the privilege of avoiding the working of the "graveyard shift," is taken up many times in negotiations between the union and the employer, and provisions are made for the avoidance of work on this particular shift by the diabetic.

If disability insurance and retirement become part of labor contracts, it will be all the more important for labor and management properly to evaluate the diabetic. This is an encouraging attitude on the part of labor and it is hopeful to note that interest is being shown at least at the higher levels. One wonders how fair it is to place the diabetic in the same category with the physically handicapped!

3. The Experiences of Industry with the Employed Diabetic.

It might be of interest to you to know the experiences of industry with the diabetic. In preparing this paper, we surveyed 31 large and small industries in the vicinity of Philadelphia, whose total employment numbers about 150,000. These included a large department store, a large mail order house, several public utilities, a large publication house, two insurance companies, and a radio and television company. The survey thus represents a cross-section of employability. There were four questions asked:

1. Will you employ known diabetics?
2. If the answer is no.... has it been based on personal and unsatisfactory experience?
3. Do you retain in your employ individuals developing diabetes if they have been with the company?
4. If the answer is yes.... what has been your experience, particularly with absenteeism and reliability with this group versus a non-diabetic group?

WE FOUND that industry can be divided about equally into two groups. The first are those who refused employment to known diabetics regardless of the severity of their disease or the type of work for which they applied. The second could be sub-divided into those who employed diabetics for certain specific types of employment and who kept no very careful record of them, and those who definitely employed diabetics whose disease was satisfactorily controlled and who were able to furnish me certain definite statistics, which I think will be of interest.

In most cases, the concerns in the first group would retain in their employ individuals who developed diabetes after a certain length of employment, and in many cases changed the type of work which they had been doing.

In the first group, the reasons given for not employing diabetics were quite varied. The policy of certain national organizations was different at the local levels. In one radio plant, employing 7,000 people, I was told by the personnel director that they did not employ diabetics because they were afraid that they would develop "convulsions and fall in the machinery." In further delving into this matter, it was found that they have in their employ a diabetic who had been with the firm for 15 years before he developed diabetes and has become a notoriously uncooperative patient, and at least every two or three months develops an insulin reaction with convulsions. He works in an office with 50 other people and it has been necessary to alert these 50 people, as well as other personnel, as to what to do with him when he gets a severe reaction. The personnel manager admitted to me that his thinking undoubtedly had been influenced by the unfortunate experience with this man, which stresses the importance of the diabetic who is employed being careful to keep his disease controlled so as not to prejudice the employment of other diabetics. So strong is the "anti-diabetic" feeling in this plant that the personnel manager told me that he knew of no other diabetics in their employ, and that he would be tempted to discharge any that developed if they had not been with the company at least five years. I pointed out to him that in all probability about 1% of his employees were diabetics anyway, and his reply was that that might be true, but if so he didn't want to know about it.

I cite this as an example of the lack of appreciation as to what diabetes really is. Another company refused diabetics because they felt that they could not work the various shifts in their turn, although possibly only 20% of their employees were on this schedule.

There appeared to be a tendency on the part of many of the companies listed in the first group above to consider diabetics, epileptics and the physically handicapped individuals in the same category. The companies in this group who retained diabetics in their employ admitted that the diabetics so retained turned out to be quite satisfactory employees, and that they felt they lost no more time because of their disease than did the average.

In the second group—those with reservations in the employment of diabetics—the impression is that these individuals are good employees. They seem loath, however, in spite of this experience to give a blanket endorsement to the employment of all of this group.

The most revealing figures are from those plants and industries openly employing diabetics and who compared them in regard to their dependability as workers, their absenteeism and their general over-all desirability against the non-diabetic group.

In a mail-order house, employing 6,000 people, there were 60 known cases of diabetes. These individuals had a better work record than the average in this company, and their Medical Di-

rector said that he "had no hesitancy whatsoever," nor did the president of the company, "in hiring controlled diabetics and expecting them carry on their activities to the satisfaction of the company."

The most definite figures I have been able to obtain were from the Philadelphia Electric Company, a local public utlity, employing 7,000 or more people. DR. MACCONAGHY, the Medical Director, has permitted me to relate his experience in that plant over the last 18 years. This company for 13 of these 18 years grouped diabetics, epileptics and the physically handicapped in one group, who, while they were employed were not entitled to the insurance sickness and job insurance benefits of the rest of the group. In studying carefully the 13 years' experience in this group, DR. MACCONAGHY recommended to the president of the company that the diabetics employed be entitled to all of the benefits the other employees received. His experience over these 18 years has proved that the diabetics so employed, (and he has carefully checked 110 of them over this time) are just as good risks from the standpoint of insurance and health benefits, as the rest of the group. The absenteeism among the diabetics has been 33% less than among the average of their employ. The only concession made to diabetics in this company is that they are not asked to work the "grave-yard shift" from 11:00 at night to 7:00 in the morning. This is the most carefully checked group of diabetics that I have been able to learn of anywhere.

A small insurance company, employing 350 people, has in its employ 10 diabetics. The absenteeism of the company was one absence for every 53 working days, while that of the diabetic was one for every 102 working days. This company conducts an annual health survey and has discovered several of these cases.

A large department store in Philadelphia has carefully checked the known diabetics in its employ, and the analysis of time lost indicates that although they have received hospital care, the care has been for other conditions than diabetes and once a patient was satisfactorily standardized, his absentee record was clear.

DR. JOSLIN some years ago made a survey regarding time lost in diabetes of 653 patients between the ages of 20 and 65 years, and DR. R. B. LAWRENCE, of England, made a similar study of 100 cases, and both came to the conclusion that time lost directly due to diabetes is practically nil or not significant.

In carefully analyzing 250 of our own patients, our conclusions were the same as those of DR. JOSLIN and DR. LAWRENCE. These series, however, were made on a group of well-controlled and carefully followed patients.

It is interesting also that the local Blue Cross, while they will accept hospitalization for diabetes only after a subscriber has been a member for one year, have had relatively few hospitalizations for this condition out of 1,500,000 subscribers. In 1948 for every 1000 subscribers protected, 118 required hospital care of some kind and, of subscribers, less than one in 1,000 were hospitalized for diabetes.

It would seem from the foregoing that the diabetic has proved himself a quite acceptable employee.

THIS paper would not be complete without pointing out the psychological trauma to a diabetic who has handled his disease satisfactorily and is refused work because of his diabetes, or must conceal the fact that he is a diabetic to obtain employment. We have educated our diabetics to believe that within their limitations they are perfectly normal individuals, and that their activities in life do not have to be restricted; and the psychological management of these cases, particularly of the juvenile diabetic, is one of tremendous importance. This is a relatively small group of individuals, but I have had several very sad experiences with the juvenile diabetics who have been followed for quite a few years, and who have graduated from college with all the necessary intellectual qualifications and have been refused positions because they were diabetics. This resulted in the individual who had conquered the diabetes, developing a tremendous inferiority complex about life as a whole, and it took a great deal of effort on the part of many people to restore a normal way of thinking.

The question as to what the medical departments of industry can do with the diabetic, it seems to me, is three-fold:

First: It should be their duty to inform the management of the actual status of a controlled diabetic as an employable risk; that they should not hesitate to employ a diabetic within the limitations of his ability to work, and that no discrimination should be shown against him because of his disease.

Second: If this is an accomplished fact, the suggested program of DR. ROOT in the detection of diabetes will be of great value. However, until the status of the individual is established with the company in case diabetes is detected, the diabetic detection drive will lack enthusiastic support on the part of most of the employees.

Third: The greatest help the medical department can be to the diabetic is to consult his family physician, and to have a record of his diet and insulin to establish a rapport with the patient and the physician so that, if necessary, urinalyses may be made while at work, or blood sugar determinations made without the employee losing time to visit the physician's office or laboratory. The importance of such close teamwork can not be over-emphasized, in my experience. With the employee realizing that the medical department is dealing with him as an individual and not directly representing the management, it will make him even more cautious and careful in the control of his disease and also less hesitant to report any symptoms or con-

ditions that might develop which could be early discovered and appropriately handled.

I am happy to say that in my experience in conducting this survey, I have been impressed with the earnestness of the medical departments in attempting to do just this, and the healthy attitude they have taken toward individuals who have, from time to time, developed an unusual amount of glycosuria or an elevation of the blood sugar. Their attitude has been not that of a truant officer, but more of a friendly and cooperative liaison between the patient and the physician.

The industrial physician can, by his interest, keep the diabetic more in line and is quite justified in suggesting dismissal of an employee who fails to follow his diabetic regime. This is often a more powerful influence than the advice of the family physician.

I HAVE attempted to present to you today the diabetic employee as he is viewed in the Philadelphia area, and I am sure that the experiences of other metropolitan centers differ little from this; and I feel that by all the accepted standards the diabetic rates an opportunity for employment and livelihood with only a few minor restrictions on what such employment may be. In conclusion one is almost tempted to suggest that the Fair Employment Practice Act be re-written to read that no one be refused work because of race, creed, color or diabetes.

A.M.A. Section on Preventive and Industrial Medicine and Public Health
—Program, San Francisco Meeting—

June 28, 1950

SYMPOSIUM on the American Worker—How Can Industrial Medicine Meet His Needs?

Moderator: CHRISTOPHER LEGGO, M.D., Medical Director, California and Hawaiian Sugar Refinery, Crockett, California.

(a) "The Viewpoint of the Personnel Administrator"—HIRAM S. HALL, Vice-President for Personnel, Bigelow-Sanford Carpet Co., New York City.

(b) "The Viewpoint of the Sociologist"—JOSEPH LOHMAN, PH.D., Department of Sociology, University of Chicago.

(c) "The Viewpoint of the Psychiatrist"—KARL BOWMAN, M.D., Medical Superintendent, Langley Porter Clinic, San Francisco.

(d) "The Viewpoint of the Physician in Industry"—HENRY H. KESSLER, M.D., Medical Director, The Kessler Institute for Rehabilitation, West Orange, New Jersey.

(e) "The Viewpoint of the Union"—HARRY READ, Executive Assistant to the Secretary-Treasurer, C.I.O., Washington, D.C.

(f) "The Viewpoint of Religion"—RICHARD L. HENRY, Minister, Tennessee Valley Unitarian Fellowship, Knoxville.

Discussants: J. M. KIMMICH, M.D., Medical Director, Campbell Soup Company, Camden, New Jersey.

LEON LEWIS, M.D., Associate Professor of Industrial Health, School of Public Health University of California, Berkeley.

SYMPOSIUM: The Specialist Looks at Everyday Medical Care in Industry:

Moderator: CHESTER L. SAMUELSON, M.D., Medical Director, Harrison Radiator Division, General Motors Corporation, Lockport, New York.

Dermatologist: E. A. LEVIN, M.D., San Francisco.

Internal Medicine:

Cardiology: B. M. OVERHOLT, M.D., Knoxville, Tennessee.

Gastro-enterology: H. S. VANORDSTRAND, M.D., Shaker Heights, Ohio.

Ophthalmologist: W. E. BORLEY, M.D., San Francisco.

Orthopedist: H. E. BILLIG, JR., M.D., Los Angeles.

Psychiatrist: F. O. DUE, M.D., Oakland, California.

Discussants: M. R. BURNELL, M.D., Detroit; L. CHANDLER, M.D., San Francisco; A. H. WHITTAKER, M.D., Detroit.

June 29, 1950

A SURVEY of the Factors Producing the 'Burned-Out' Young Business Executive"—S. A. PORTIS, M.D., Chicago.

Discussant: W. E. SHEPARD, M.D., Metropolitan Life Insurance Co., San Francisco.

"Statistics Can Tell the Story of Industrial Medicine"—C. C. HURD, PH.D., Intenational Business Machines Corp., New York City.

Discussant: J. A. RAFFERTY, M.D., Chief, Department of Biometrics, Air University School of Aviation Medicine, Randolph Field, Texas.

DEMONSTRATION Symposium—"What are the Dynamics of Industrial Hygiene?"

Moderator: JAMES H. STERNER, M.D., Associate Medical Director, Eastman Kodak Company, Rochester, New York.

(a) Presentation of an Unidentified Occupational Case History—R. J. HASTERLIK, M.D., Acting Director Health Service Division, Argonne National Laboratory, Chicago.

(b) Surveying the Plant—D. J. LAUER, M.D., College of Medicine, University of Cincinnati.

(c) Studying the Environment—F. E. ADLEY, Industrial Hygienist, General Electric Company, Nucleonics Department, Richland, Washington.

(d) Chemical Analysis—F. R. HOLDEN, PH.D., Chief, Health Physics Branch, Naval Radiological Defense Laboratory, San Francisco.

(e) Maximum Allowable Concentrations—H. H. HUDSON, M.D., Director, Industrial Hygiene Service, Department of Public Health, Nashville, Tennessee.

(f) Control: Medical: R. A. KEHOE, M.D., Department of Preventive Medicine and Industrial Health, University of Cincinnati. Environmental: B. F. POSTMAN, Industrial Hygiene Engineer, Employers Mutual Liability Insurance Co.

(g) Summary: A. G. KAMMER, M.D., Graduate School of Medicine, University of Pittsburgh, Pittsburgh.

Discussants: R. T. JOHNSTONE, M.D., Los Angeles. A. J. LANZA, M.D., New York University—Bellevue Medical Center.

June 30, 1950

DOES the Health Officer Now Have Status?"—C. N. NEUPERT, M.D., Chairman, Section on Preventive and Industrial Medicine and Public Health, American Medical Association.

SYMPOSIUM: Screening Technics for the Discovery of Chronic Disease in the Adult Population.

Moderator: HENRIETTA HERBOLSHEIMER, M.D., Medical Administrative Assistant, Department of Public Health, Springfield, Illinois.

DWIGHT M. BISSELL, M.D., Health Officer, San Jose, California.

LESTER BRESLOW, M.D., Chief, Chronic Disease Service, Department of Public Health, Berkeley, California.

C. KELLY CANELO, M.D., San Jose, California.

VLADO A. GETTING, M.D., Commissioner, State Department of Public Health, Boston.

Discussants: L. E. BURNEY, M.D., State Health Commissioner, Indiana State Board of Health, Indianapolis. W. E. HALVERSON, M.D., Director of Public Health, San Francisco.

"Incidence of Trichinella Infection in San Francisco, 1950"—R. R. BEARD, M.D., Department of Public Health and Preventive Medicine, Stanford University School of Medicine.

SYMPOSIUM on Q Fever:

Moderator: MALCOLM H. MERRILL, M.D., Deputy Director, Department of Public Health, San Francisco.

R. J. HUEBNER, M.D., Laboratory of Infectious Diseases, Bethesda, Maryland.

E. H. LENNETTE, M.D., Chief, Viral and Rickettsial Disease Laboratory, Berkeley, California.

H. G. STOENER, SR., Assistant Veterinarian, Rocky Mountain Laboratory, Hamilton, Montana.

Discussants: M. DOROTHY BECK, Bureau of Communicable Diseases, Berkeley, California. Acceptance pending (MR. HARTWELL WELSH, Entomologist, Viral and Rickettsial Disease Laboratory, Berkeley, California.

Role of the Medical Department in the Management of Accident Cases Involving Diabetics

JOHN A. REED, M.D.,
Secretary, American Diabetes Association,
School of Medicine, George Washington University,
Washington, D. C.

THE MATERIAL and the case records which constitute the premise for the discussion of the title assigned to me are not the result of experiences in industrial medicine but are taken from my association with a somewhat different group of individuals. The experiences might well be transposed, however, because of major similarities to industrial problems. I am the chairman of a board of nine physicians and surgeons whose duties are the care of the medical and surgical conditions arising in 3,000 persons in the city of Washington. These 3,000 persons are the Metropolitan Policemen of the nation's capital, members of the Fire Department of the District of Columbia, the so-called Park Policemen of the National Parks in and about Washington, D. C., and the White House Policemen.

Several difficult individual problems involving diabetes came under our observation in the last two years which prompted action in keeping with the concept evolved from the American Diabetes Association and the good practice of preventive medicine, namely, a survey of the men under our care as to the presence or absence of diabetes.

Let me give you briefly the organizational and administration set-up of the medical department which provides care for these persons. Under an Act of Congress there are provisions made for this group to receive medical and surgical care for all diseases and injuries whether or not they are the result of the performance of their duty. Hence, a group of physicians is chosen to render this care. Further provision is made that the care is voluntary on the part of the individual, as he can elect to seek medical and surgical care from physicians outside of those assigned by the District of Columbia government. Suffice it to say that 95%, as has been determined by a recent survey, are given medical and surgical care under this group of physicians. These men receive treatment in an ambulatory clinic, in their homes, or in hospitals. Hospitalization is provided for by public funds only in the event the illness or surgical situation is considered the direct result of the performance of duty. Ambulatory clinic care and home care are provided regardless of the causative factors. All but one of the physicians caring for these persons have teaching appointments in one of the two local medical schools, and all are on the visiting staffs of one or more hospitals in the nation's capital. The ambulatory clinic is a complete one. It has a comprehensive laboratory and all other facilities for diagnosis and treatment.

These persons coming under our care are subject to occupational trauma and injury more or less specific to their particular occupation. The hazards are fairly great, and they are subject also to exposures of weather. I can give no comparison between this particular occupation and others but the over-all sick record, including accidents, injuries and sickness, is approximately 13.7 days per year per man. This is relatively high compared with the sick record of the average government employee, but when an accurate analysis is made of this record one will see that it does not particularly compare unfavorably with the sedentary occupation of the usual government employee. A few years ago the average sick record for the sedentary government employee was approximately 7.5 days per year per employee in many of the government departments, with a low record in one small division of one of the departments of 2.8 days per individual. The record of the personnel of the departments under our care when further analyzed is good.

The personnel of these departments is allowed 30 days sick leave annually, with pay, by Act of Congress, regardless of causative factors, whether considered a direct result of the performance of duty or not. When illness extends beyond the allowed 30 days and the condition is adjudged the direct result of the performance of duty, indefinite sick leave is permitted, with pay, and such adjudication is dependent entirely upon the physician in charge of the case. Hence, an individual, let us say, who has a gun-shot wound of the chest with a subsequent hemothorax may take several months or longer before he is back on the job. I remember one who had a fracture of the humerus with difficulty in uniting of the fragments and was off duty some 18 months. All this accrues to the sick record. Let us now look at a few statistics of the over-all annual sick record in order to evaluate the importance of preventive procedures. During the year 1948 the following data were computed:

Cardiovascular disease	1887 sick days.
Fractures	1763 sick days.
Gastro-intestinal disorders	4715 sick days.
Joint, bone, and muscle diseases	6902 sick days.
Respiratory diseases	13072 sick days.

Twenty-five per cent only of the total allowed sick leave by regulation was used; average 7.5 per man.

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Let me give you an example of a preventive program that was instituted some three or four years ago that not only has reduced the annual loss of time by 50% in this particular field but has also served the purpose of making a happier and more comfortable employee. About five years ago our otolaryngologist was replaced by a new physician. This new man was particularly interested in allergies and instituted a preventive program against them, especially seasonal asthma and similar conditions. I do not have the exact figures, but just before I left to meet with you here I discussed this matter with the physician in charge of this department and he stated that the last time he had made an analysis and compared sick leave records there was approximately 50% reduction in the total loss of days from such conditions.

Any preventive health program should encompass probably three aspects at least: first, the maintenance of health and the prolongation of life; second, economic reward—economic reward to the individual in the sense of greater productivity; and finally, at least some feeling of psychological well being in the mere maintainance of health.

In dealing with the emergency medical and surgical conditions from time to time in our work, problems have arisen where diabetes has injected new and more difficult situations with which to cope. Because of this aspect of the management of emergency situations, a preventive program through a diabetes detection study in these branches of the public service with which I have been connected has been instituted.

I would like to cite by way of example a few of the problems that arise in emergency medical and surgical situations that need extra attention over and above the immediate emergency situation where diabetes has complicated the picture.

Before I do this, let me discuss the problem of trauma in diabetes in general. As an etiological agent in the production of diabetes, I feel that it is impossible to attribute to trauma the role of a causative agent. In the available literature there have been cited situations that have led one to believe that trauma might have been a direct etiological factor in the production of diabetes, but generally this is not accepted. Certainly there is accumulative evidence to show that trauma indirectly can at least aggravate an already present diabetic situation, and even possibly bring to light latent diabetes in an individual otherwise possibly hereditarily predisposed to the condition. There is however no particular permanency to the increased severity of diabetes, and it is probably a momentary or temporary situation, but it is these various periods of temporary increase in severity that give rise to considerable tension on the part of both the physician and the individual concerned.

Trauma also has entered into the problem of diabetes in many legal aspects, and it is to this end that the presence or absence of diabetes in those under one's care from an industrial standpoint may have considerable importance in certain instances. This is true, certainly, in positions where compensation from disability is to be considered.

The presence of diabetes in accident cases may have quite a bearing, often times from other legal aspects. It is a well recognized concept that many of the diabetics are discovered and brought to light through the examination of a specialist such as the ophthalmologist. Many patients are referred to the private physician or to the family doctor or to one who is more or less engaged in diabetic work through the opthalmologist. The ophthalmologist cannot always be specific and make a definite diagnosis of diabetes, but only that there may be a suspicion of it, or, through his ophthalmological examinations, he can definitely state that there is some existing chronic systemic disease. Many are the patients I have received in my private work through the office of the ophthalmologist. This brings us to the point where accidents have not infrequently occurred as a result of poor vision secondarily due to the presence of diabetes which may even be in an undiscovered and pre-clinical state, or at least in the phase where the usual characteristic symptomatology of diabetes has not become evident to the individual. One can readily understand this when an example is cited such as one of our firemen who, while he was engaged in his work of fighting a fire and establishing a ladder against a brick wall, had the ladder dropped on the toe of his foot. Within a very short time this toe became inflamed, red, dark and showed evidence of early gangrenous changes. Further and more exhaustive examination revealed that there was considerable sugar in the urine, and the man had a blood sugar well over 200. In other words there was an established diabetes without preexisting symptoms of the usual characteristic textbook picture. The individual then had gangrene due to trauma, superimposed upon a diabetic condition. At a later date the arteries of his lower extremities were further examined by roentgenological studies and found to have considerable sclerotic changes present. This occurred in a relatively young man of 45.

THE ROLE of the Medical Department in industry in the management of accident cases where diabetes is known to exist differs little if any from the role of the medical approach to the known diabetic in any accident.

The cases might well be divided generally into those receiving ambulatory treatment and those requiring hospitalization. In any event, unless vomiting occurs, or unless secondary infection prevails, the management of the existing diabetes should be the same as prior to the accident, provided of course, the management is such as to bring about control. There should

be no interruption in the management of the diabetic, certainly no interruption in the intake of the carbohydrate content of his food or insulin, if insulin has been used. It is a fairly well accepted fact that in trauma diabetes at times is aggravated and this may require additional insulin or even a change in the kind of insulin. Let me give you an example.

One of our policemen, on the morning of September 15, 1948, at 7:00 A.M., had an accident involving the police car he was driving. He was a known diabetic taking 20 units of regular insulin morning and night. On admission to the hospital he was in an unconscious state. X-ray studies disclosed the collapse of the right lung with a complete fracture through the shaft of the sixth posterior rib. This fracture had evidently punctured the right lung, with air in the soft tissue of the axilla extending upward toward the neck. There was also a fracture of the 4th, 5th and 6th left posterior ribs approximately two inches from the spinal attachment. There was no fracture of the spine. There was a fracture of the scapula which showed no comminution. No fracture of the skull was revealed. The CO_2 combining power on admission was 41 volumes per cent and the blood sugar was 239. There was 4 plus acetone in the urine, the entire first day. Because of the presence of acidosis and because of the unconscious state, glucose and insulin were administered, the former given intravenously. In the course of 24 hours he had received nearly 100 units of regular insulin at varying intervals throughout this period. On the following day consciousness had been regained and he was placed on his usual diabetic regime, but instead of the 20 units of regular insulin he required approximately 25 units of globin insulin twice a day to keep his diabetes in a reasonably good state. Aside from the fractures mentioned, he had a hemothorax. He remained in the hospital from the September 15 until October 17. This is an example of injury aggravating an already known diabetes, which eventually leveled off to the pre-accident state.

In the presence of infection diabetes always becomes more severe. This increase in severity in turn requires closer supervision with undoubtedly larger doses of insulin. These factors must always be borne in mind. Then again, in injuries of the distal extremities where there is possibility of infection or gangrene, careful control of diabetes is absolutely essential and possibly hospitalization care would be the ideal. In those accident cases where sufficient injury has been brought about to require hospitalization not infrequently individuals are unable to take their full prescribed diet. In this event, of course, the carbohydrate content of the diet should be given either in liquid form by mouth or, if necessary, intravenous feedings of glucose with probably the institution of rapid-acting insulin to burn up the readily available glucose. Today, as most of you know, the prolonged-acting insulins or combinations of the prolonged-acting insulins and the rapid-acting insulins are used almost to the exclusion of the rapid-acting insulins, and where we substitute in hospitalized cases intravenous glucose for the carbohydrate content of the diet, rapid-acting insulin is to be used only.

IN ALL accident cases the ideal management of diabetes is complete control. This tends to assist in the repair of the injured tissue. As I mentioned before, infection is quite common as a secondary factor in injuries and accident cases and in the presence of infection, even in the heretofore well controlled diabetic, the blood sugar rises rapidly and to considerable heights and more insulin is necessary to maintain good control. As the infection subsides it is necessary, therefore, to reduce the insulin, as insulin reactions would undoubtedly occur if the same increased dosage were maintained. This requires rather constant attention and application on the part of the attending physician, and repeated blood sugars to my mind are the best guide, even more so than fractional urinalyses. They give a truer picture of the happenings in the metabolic performances of the individual. I would feel that in the known severe diabetic, regardless of the degree of accident, hospitalization would be warranted in practically every case in view of the many unforeseen possibilities attendant upon accident and injured cases. It has been my experience in the management of diabetics in private practice as well as in my work with the Police and Fire Department that accident cases do very much better under close supervision in the hospital ward than in an ambulatory clinic or under home care. Many problems are avoided and overcome when they do arise.

LET ME be a little more specific now relative to the role of the medical department in accident cases where diabetes is not known to exist. I would give you a very few simple rules to keep in mind.

1. Suspect and determine the presence or absence of diabetes in every accident case. The simplest and easiest procedure is to do an immediate urinalysis, and if positive of course do a blood sugar determination.

2. In every head injury, especially where unconsciousness or semi-consciousness is evident, a blood sugar determination should be done immediately and if at all possible a carbon dioxide combining power. If facilities are not available for the determination of the carbon dioxide combining power a simple test of the urine for the determination of acetone bodies is readily and easily available to any medical group.

3. In any accident case where convalescence is prolonged beyond the expected time the presence or absence of diabetes should be determined.

(If No. 1 is followed, No. 3 becomes unnecessary.)

4. In all injuries to the lower extremities the presence or absence of diabetes should be immediately determined, and if facilities are available roentgenological studies of the arterial vascular bed should be made to determine the presence or absence of sclerotic changes in the vessels.

5. In all cases where visual acuity seemingly is impaired, and possibly a background for inefficiency or the possible cause of accidents, ophthalmological studies of the eye grounds should be undertaken and further determination should be made as to the presence or absence of diabetes.

6. In all cases involving symptoms not ordinarily thought of as those pertaining to the presence of diabetes, such as tiredness, cramps in the legs, visual disturbances and rapid loss of weight without apparent cause, diabetes should be considered.

Several case records will serve to impress the importance of the consideration of the presence of diabetes where classical symptomatology is lacking.

One of our firemen had injured his back several years prior to the onset of the symptom of cramps in the legs. A tentative diagnosis was made by the orthopedic specialist of possible nucleus polyposis and on further consideration diabetes was diagnosed. With the adjustment and leveling off of blood sugar the cramps in the legs disappeared. A police officer of 23 years service was assigned to a post guarding some valuable materials in a warehouse. He was permitted to sit down on the job and, on routine night-rounds by the night inspector, was found to be sound asleep. He appeared to be in a stuporous condition and there were evidences that he had been sick and vomited and it was thought he was under the influence of alcohol. Attempts to arouse him proved futile and he was immediately sent to a hospital, where diabetic acidosis and diabetes were discovered, unknown to the individual although at a later time he did reveal that he had been passing large quantities of urine and had had considerable thirst in the past month or two but did not consult the physicians in view of the fact it was hot weather and he felt this was the reason. Here was a diabetic, obese, vomiting, and finally in a semicomatose state of diabetic acidosis.

One of our policemen received a very low efficiency rating and consulted the medical department regarding his general condition. He knew that he had not been up to par in his work and his only complaint, as he put it, was "a general run down condition." When held down specifically as to the interpretation of this expression he said that he tired out very easily and felt weak. Routine examination of the urine revealed 4 plus sugar and a blood sugar of nearly 300. The only other feature about the case that pointed to diabetes was the fact that he had lost some 15 pounds in weight in the past three months.

Examples of this sort induced us to run a diabetic survey, and I would like to close my report by giving you briefly our findings to date. The complete study is not yet finished but we have examined 2637 specimens of urine; 488, or 18%, of the total number were found either to have a faint trace or up to 4 plus in the urine. On all these individuals fasting blood sugar determinations were made. Of the 488, we have completed 269 blood sugar determinations, and 89 of these have had a blood sugar level of 135 in the fasting state, or 3%. It is interesting to note that of the total 89 with a fasting blood sugar over 135, 76, or 85%, were over their ideal calculated weight.

IN SUMMARY I would say that the medical department of any group has a certain responsibility in regard to the care of the individuals, and a study to determine the presence or absence of diabetes certainly would have great value.

Investment Per Job

THE National Industrial Conference Board has from time to time published data on the investment per job in manufacturing. Figures for 1946 are as follows: Chemicals and Allied Products, $24,515; Food, Liquor and Tobacco, $10,364; Printing and Publishing, $7,387; Paper, Pulp and Products, $7,094; Metal Products and Processes, $6,736; Rubber Products, $6,603; Stone, Clay and Glass Products, $5,110; Textiles, Apparel and Products, $3,409; Lumber and Wood Products, $3,169; Leather and Its Products, $2,940; Miscellaneous Manufacturing, $7,094; Total Manufacturing, $7,113. The average investment per job in this group is over $7,000. These figures, of course, are based on historical costs and most of the investments were made when equipment and construction costs were much lower than they are today. If we allow for increase in replacement costs, it is a fair estimate that the cost is now at least $10,000 per job. In electric utilities investment per job is about $60,000. In railroads it runs to over $20,000 per worker. In petroleum, steel and many others the figures are substantially above the average indicated. It is the current, not the historical, cost of investment which governs the requirement for capital resources to make new jobs.

—From "Investment for Jobs," Chamber of Commerce of the United States.

The Diabetic in Industry and His Employer

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DIABETES in industry is not a major problem, although the number of diabetics in the labor market, particularly at the younger ages, has been growing. This reflects in great part the increased longevity of the diabetic. Thanks to insulin, diabetic children now grow up and are able to take their places in society. The adult diabetic not only lives longer, but is in better physical shape to take a job today than the diabetic of 20 years ago. It is a fact, too, that with the increase in medical service of all types, including pre-employment and industrial medical examinations, more cases are being discovered than ever before. The possibility of continued extension of such services is likely to add further to the numbers of known diabetics. Fortunately, cases so discovered are generally in the early stage of the disease when prompt and aggressive treatment can be especially effective.

We do not have exact figures on the annual incidence of new cases or of the prevalence of diabetes. But such data as we have clearly indicate that the problem of diabetes in industry stems not from the applicant for employment, but from the employee who has been in service for a long period. Diabetes in young people is quite rare.[1] The greater part of the diabetic population today consists of women and older people who are not in the labor force. Less than 1% of the working population are known diabetics, and of these, at least two thirds are past 45 years of age. The rate of occurrence of new cases in the working population is actually so low —less than 1 per 1,000 annually—that only very large plants or industrial groups would have more than a few employees develop diabetes within a particular year.

Another set of facts which have a bearing on our subject is the great improvement that has taken place in the prognosis of diabetes at every age. Thus, while the long-term trend of the death rate from diabetes in the population has been upward until comparatively recent years, this is accounted for largely by the increase in the number of deaths among older persons, and particularly women.[2] The picture at the working ages of life is decidedly different. A comparison of the death rates from diabetes among white male industrial policyholders of the Metropolitan Life Insurance Company in 1920-1922, just before insulin came into use, with the figures for 1946-1948, shows a reduction of 65% at ages 25 to 34; of 40% at ages 35 to 44; of 22% at ages 45 to 54; and of 11% at ages 55 to 64.

The improvement in the outlook for diabetics is brought out even more clearly by the extraordinarily good clinical records of diabetic patients kept by DR. JOSLIN and his colleagues at the George F. Baker Clinic in Boston. We in the Metropolitan have worked with that group now for 20 years, and, from the material collected, have been able to measure not only the improvement in mortality among diabetics, but, on the basis of these mortality rates, to show how the expectation of life has gone up.[2,3] While the figures cannot be taken as representative of the entire diabetic population, they show what the general trend has been.

The analysis of these records of diabetic patients of the George F. Baker Clinic shows large and uninterrupted reductions in the death rates in successive periods over the 50 odd years covered by the experience. The improvement has been most rapid since insulin came into use, and has been greatest among children and young adults. For example, in the period 1914-1922, the annual death rate among patients at age 20 was more than 400 per 1,000; in other words, two out of every five patients in this age group died during the year. Immediately following the introduction of insulin therapy, this death rate was cut nearly 80%, and has since been reduced still further. In recent years the death rate has been of the order of 10 per 1,000 per annum, or more than 95% below the pre-insulin figure. At age 40, the death rate in recent years shows a reduction of over 90% from the pre-insulin level. If we examine the facts on the expectation of life, we find that at age 30, for example, the expectation has increased from six years under the conditions prevailing before insulin came into use, to 30 years under present conditions. Even at age 50, the expectation of life today is six years greater than in the pre-insulin period.

The facts on the causes of death of diabetics in successive periods of treatment further highlight the profound improvement in the outlook for diabetics. Among the patients of the George F. Baker Clinic, few diabetics have died in recent years of the typical complications of pre-insulin days. The death rate from diabetic coma has been cut 99%. The death rate from diabetic gangrene is down almost two-thirds from the pre-insulin level, even though the average duration of the disease in diabetics of recent years is so much greater than it was in the pre-insulin days. Furthermore, the outlook in this respect

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has improved very greatly in recent years. The radical surgery that was the rule a decade or more ago is employed much less frequently today. Thus, it is less likely today than before that a diabetic worker will experience a major amputation for diabetic gangrene. The death rates from pneumonia and tuberculosis have also been radically reduced—80% and 90% respectively from the pre-insulin levels.

Of particular interest from the industrial standpoint is the accident record. Actually, deaths from accidents have always been a relatively small part of the total mortality among diabetics. The recent experience of the George F. Baker Clinic shows that of 2,299 deaths reported from 1944 to April, 1949, only 44, or 1.9%, were ascribed to accidental causes. At the working ages the experience is actually better. Thus, during 1939-1947 accidents accounted for only 1% of the deaths among patients between ages 15 and 65 at first observation. The death rate from accidents has not increased even though diabetics are living longer and their exposure to accidents is greater as a result of their increased activity.

LET US consider next the available facts on the working record of diabetics. Actually there is little statistical information on the subject. In the various studies that have been made on the potentialities of handicapped workers, little attention has been paid to diabetics, and one might almost say that the dearth of material on the subject is a good indication that they were assumed to have virtually normal working capacity. We can quickly review then the data collected on the subject here and abroad. We should warn you that we cannot give you an absolute measure of the absenteeism experience of diabetics as compared with non-diabetics. Any of you who have had contact with morbidity statistics know their deficiencies and pitfalls. The reasons for variation in sickness rates are legion. Consequently, to make any hard and fast comparisons along these lines would be dangerous. We would stress the point, too, that one should not be hypercritical. In considering the working records of diabetics or other handicapped groups, the main concern is that these workers perform their duties well and are on the job with a reasonable degree of regularity, and not that they conform to some theoretical average. There is plenty of variation in absenteeism among entirely healthy people.

The first important contribution to the study of the working capacity of diabetics was made about 10 years ago by LAWRENCE and MADDERS in England.[4] Their study was based upon interviews of 100 employed diabetics attending the clinic of the Diabetic Department of Kings College Hospital, London. A wide variety of occupations was represented in the group. The average period of employment was five years. Seventy-five of these workers were men and 25 women. Their ages ranged from 14 to 65, but 73% were under 40. Five out of every six cases used insulin. Of the 100 patients, 39 had lost time only at the onset or diagnosis of the disease. Only 23 reported losing time on account of the disease after the initial period of treatment.

Quite another type of study, also made about 10 years ago, was based on interviews by DR. JOSLIN and his colleagues at the George F. Baker Clinic.[5] They questioned 653 consecutive patients between the ages of 20 and 65 who returned for treatment or check-up during late 1938 and early 1939. This study attempted merely to elicit a general picture, but, even so, it indicates the high degree of working capacity among diabetics. Of the men in the group, 63% reported themselves as able to work full time, and 27% approximately two-thirds of the time. Only 5% were completely disabled at the time of the interview.

THE most adequate study of the work record of diabetics made thus far was part of an extensive study of the performance of physically impaired workers in manufacturing industries,[6] which was conducted in 109 different plants during 1946-1947. Interestingly enough, the investigation of diabetics was begun only after the study was under way so that data for diabetics in the first 10 plants of the entire group studied were not included. The data on this study were collected by field workers of the Department of Labor. The records covered from six to 18 months, but in most plants, a period of a year. A condition of the study was that the employer have at least 20 impaired workers of all types. The method used in this study was to match each impaired worker in a specific category of the handicapped with one to three unimpaired workers. In making up each control group, such factors were taken into consideration as sex, age, incentives, hazards, shift, experience, etc. The number of diabetics included in the study was 144, and there were 244 workers in the matched control group. The 144 diabetic workers represented 15 of the 19 major industrial groups and 45 of the 99 plants in the entire study. The range and variety of skill required by the jobs held by the diabetics was very broad. Since the average age of the diabetics was relatively high, however, the percentage of skilled and experienced workers was large as compared with other handicapped groups.

On the whole, these diabetic workers made a creditable showing, although not as good as reported for the control group. The total absenteeism rate among diabetics was 4.4 per 100 scheduled work days, as compared with 3.1 in the unimpaired control group. The rate in the diabetic group is higher but is not excessive. It is noteworthy that 23.5% of the diabetic workers had no absences as against 26.3% of the non-diabetic workers, and the proportion of individuals with absence rates up to two per 100 scheduled work days was identical in the diabetic and control groups. The difference between the

two groups was accounted for by a very few diabetics with high absenteeism rates.

The accident experience of the diabetic workers was likewise fairly satisfactory. The frequency rate for non-disabling injuries was 7.8 per 10,000 exposure hours among diabetics as compared with 7.4 in the control group. Fifty-one percent of the diabetic workers had no injuries of this kind as against 56.5% in the control group. In general, the types of injuries were quite similar in the two groups, with cuts and abrasions predominating. As noted in the published report of this study, there is a possibility that diabetic workers would be more conscientious in reporting even minor injuries for immediate treatment because of their knowledge of the danger of infection, and this factor would, of course, influence the reported rates.

The disabling injury rate was also somewhat higher in the diabetics than in the control group —15.6 and 12.9 million exposure hours respectively, and the time lost per 100 working days was 0.11 and 0.07 respectively. The time lost for disabling injuries was thus less than 3% of the total time lost. These figures, however, represent such few actual cases of disabling injury that no great significance can be attached to them.

The last set of figures relates to the experience among our active working force in the Home Office of the Metropolitan Life Insurance Company in New York City. A recent survey of company records shows 92 known diabetics employed at the Home Office of whom 89 are at work. There are three diabetics on permanent disability, but in one case diabetes is not the cause of the disability. In our study we have included not only the clerical workers, but also those on our maintenance staff. The 18 active cases in the latter group are engaged in a variety of occupations comparable to those in industrial employment. The age composition of our diabetic group illustrates clearly that the problem of diabetes in industry is concentrated in the middle and later age groups. The age at onset was 40 or over in two-thirds of the cases and averaged 44 years. With regard to the present age, the range is from 27 to 68 years, but 85% are 40 and over, and the average is close to 50 years. Approximately two-thirds of the cases are males. This proportion is slightly higher for the maintenance than for the clerical staff. The preponderance of males reflects the higher average age of the men in our employ. As is generally known, the great bulk of the company's clerical staff consists of young women.

These diabetic employees are valuable people. Their length of service at onset of their disease averaged nearly 18 years, and their total length of service to date, nearly 24 years. Thus, they average six years of service since the discovery of their disease, or approximately one fourth of the total period of service with the company.

For reasons indicated earlier, we have not attempted to measure the attendance record of these workers against the general company average. We have, however, judged the attendance records of these individuals on the basis of frequency and duration of absences during the 20-month period from January, 1948, to September, 1949. On this basis, we have classified the individual's absence record as Excellent, Average, Fair, or Poor. The record was judged to be excellent in 40% of the cases, and average in 19%. Thus, in three out of five cases the record was satisfactory. Only 15%, or about one in seven cases, had relatively unsatisfactory records. The maintenance workers showed up slightly better than the clerical workers. On the whole, the record of the men was better than that of the women, largely because of the more frequent short absences among the women. Cases classified as having poor attendance records, however, were found in approximately equal proportions among the men and the women. With regard to age, the experience among the older diabetic employees was relatively more satisfactory than among the younger. This is not unexpected in view of the fact that the disease tends to be relatively mild at the middle and older ages.

The major credit for the good record of our diabetic employees belongs to the workers themselves. It has been accomplished without a comprehensive program of supervision by the Medical Division of the company. Our medical people have considered such a program to be unnecessary. Diabetic employees who wanted to have their own physicians take complete responsibility for their treatment have been left alone. Others who wanted to consult our staff physicians have been encouraged to do so. Diabetic employees who take insulin may have their injections given in the Medical Division in accordance with their wishes or at the request of their physicians. The services of our medical laboratories are available to them. We may note that the company serves lunches to all Home Office employees, and for diabetics and others on special diets, specially prepared meals are available.

This relatively informal type of program, under which the company offers services in amount and in degree consistent with the employer-employee relationship and which the employee can use according to his needs or desires, has served well. The diabetic employees know what the company can and is willing to do for them, but there is no attempt to urge any service on them. Nevertheless, the judgment of the company's physicians is that they get reasonably good cooperation from the diabetic employees, and this is reflected in the results we have described.

TO SUM UP, these studies indicate that the work record of diabetics in industry is satisfactory. The great majority of those who are under reasonably good medical care can carry on their jobs as well as non-diabetics, and as well as they did before the onset of the disease. We do not claim that they are better than the unimpaired

workers, nor that they are exceptionally intelligent people who deserve extra consideration. But they do well enough to warrant their continued employment without restriction, except in very few jobs. Naturally, a shift from one job to another sometimes is advisable because of change in the diabetic's physical condition, but this is true of workers generally. The guiding principle is that a diabetic should not be in a position where, experiencing a reaction or any other diabetic emergency, he might endanger the lives of others as well as his own. This still leaves a very wide range of jobs in industry where there need be no concern regarding the employment of diabetics.

Yet, even today the diabetic too often has difficulty getting or holding a job when the presence of the disease is acknowledged or discovered on medical examination. There are several reasons for this. The publicity given to the increasing death rates from diabetes may be partly to blame. In some instances the attitude of management is colored by unfavorable experience with an exceptional case or by the impression, persisting from earlier days, that infections in diabetics were frequent and severe and that the risk of accidents was high. The accident problem involves not only compensation benefits, but also the possibility that an accident might be judged legally to have caused the diabetes. There is no denying that occasionally there are real problems. But they no longer have the importance they once had, and in these days should not stand in the way of a more liberal attitude on the part of management with regard to the employment of diabetics.

There is much that the employer and the industrial physician can do for the diabetic worker. We recommend no specific program because this will vary from place to place and from plant to plant. Most important is a favorable attitude to the diabetic worker and consistent encouragement to him to obtain good medical supervision and stay with it. If the circumstances in a particular plant or area are such that it is desirable for the industrial physician to render this service, it should be provided.

The diabetic employee should be encouraged to learn the facts about his disease. The industrial physician can promote the education of diabetic patients, and in some instances might even organize small informal classes for the few diabetics within the plant. Today we no longer need to prove that knowledge of his disease pays the diabetic. It gives him a better understanding of his condition and enables him to cooperate more intelligently with his physician. This is conducive to better health and greater vitality. The diabetic needs to know how to avoid coma or insulin reactions, and what to do if either impends. He should know and practice the rules of good foot hygiene.

It is also of mutual advantage to the diabetic worker and his employer if the worker is encouraged to let his fellow workers know that he is a diabetic. This facilitates immediate attention and treatment on the rare occasions of a diabetic emergency such as insulin reaction or coma. The diabetic worker should also be encouraged to get prompt treatment for injuries in order to avoid the danger of serious infection.

Another way in which the employer and industrial physician can aid is in the early discovery of diabetes. This may be accomplished by routine laboratory tests at the annual physical examination, by a mass testing program, or both. In this connection, we would emphasize again the point that the major problem of the diabetic in industry is the man who is already on the job and not the man who is applying for a job. Cooperation of industry in mass testing programs during Diabetes Week, which has been inaugurated as an annual affair by the American Diabetes Association, can do much to put over community efforts to discover early diabetes and bring it under treatment promptly.

For the employer, encouragement of and cooperation with the diabetic employee brings many advantages. Fair or even generous treatment of the employee with a handicap fosters good industrial relations. Helping diabetic workers generally means retaining for many years the services of experienced and loyal people. It means less loss of time for illnesses and less likelihood of serious accidents. On the other hand, an unfavorable attitude toward employment of diabetics is detrimental both to employer and worker. It leads to the concealment of the disease and that may bring harm to the diabetic and sometimes to his fellow workers. It creates an atmosphere of discouragement and discontent among diabetics who can perform useful and productive work. It adds to the number who are a burden to themselves and their families. It adds to the number receiving unemployment or relief benefits, the costs of which are borne to a great extent by industry. It gives point to the claim that industry is interested in profits only and not in the welfare of the workers.

IN CONCLUSION, employers today have the opportunity to enable diabetics and other competent handicapped persons to earn a living and thereby to support themselves and maintain their self respect. This is in keeping with the ideals of our democratic society in which all who can contribute to the common welfare deserve a chance to do so.

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The Diabetic in Employment

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I HAVE been asked to discuss the problem of "The Diabetic in Industry." I wish to thank you for this opportunity for two reasons. In the first place I am interested in the treatment of diabetics, in their welfare and their problems from the standpoint of the individual, and secondly I am interested in the broader aspects of the role the diabetic must play in the community. A very important factor to both the individual and the community is the problem of employment. I realize that nothing constructive can be accomplished by merely asking that jobs be given to diabetics unless we are candid about the whole subject. We must admit their handicaps and limitations and at the same time we must not minimize their capabilities as has been done in the past. I am anxious they be given employment. I know that they are good employees, are honest with their employers, and by their work can convince the employers of labor that the diabetic is employable and that the ideas of a quarter of a century ago do not apply today. I feel that the time has arrived when we must realize that because an individual has diabetes it does not constitute sufficient justification for refusing employment to him in a great many industries and in most companies.

The problems of the diabetic may affect a large section of the community. Diabetes is a fairly common disease. In the United States it is estimated that there are 1,000,000 known diabetics. Another 1,000,000 have it and are undiagnosed. It has been estimated that 4,000,000 people now living in the United States have diabetes or will develop it before they die. It is obvious that, from the standpoint of the community, the question of employment for diabetics is important and that it directly or indirectly affects a great many people.

The diabetic should not be forced to become a problem in social medicine. He is employable and should not be prevented from gaining employment by arbitrary company rulings. The diabetic does not ask the government for special diets or for free insulin. He does not require special sanatoria or isolation hospitals nor does he require the services of government subsidized clinics such as the cancer, tuberculosis or venereal disease clinics. All he requires is the right to obtain employment. The ability of a diabetic to gain employment has narrowed markedly in recent years and unfortunately this has occurred at a time when, if given the opportunity, he could demonstrate that in the right job he is as good as or better than the average employee.

There are a number of factors concerned in the problem of employment. In the first place, the medical examiner for a company may refuse to accept a diabetic for employment. In some cases this is a definite company ruling. In others it is at the discretion of the doctor. This attitude has been influenced largely by the question of morbidity.

Recent statistics covering large groups of diabetics in industry are not available to present concrete data as to morbidity rates, loss of time, etc. Certainly the impressions of 10 or 20 years ago should not be the criteria on which employability is based. Today with better diets, improved nutrition, advances in insulin therapy, and the use of antibiotics and the sulfa drugs, the life of the diabetic has changed appreciably.

The changes in morbidity rates have altered throughout industry in general. One would not use data collected 20 years ago in describing present conditions, and I do not see why the diabetic should not be judged on his present performance. This is a field which could be explored in many corporations. In a recent survey the Bell Telephone Company of Pennsylvania reports that the time lost by its diabetic employees was no greater than that of the average employee. We must obtain more data.

THERE is another factor which must be considered and that is the question of suitable employment. Here we must distinguish between the diabetic who can be controlled on diet alone and the diabetic who in addition to this diet requires insulin. It is the latter group that constitutes the main problem. One must realize that a diabetic who takes insulin may, as a result of increased work or failure to have meals on time, develop hypoglycemia. If he does have an insulin reaction his judgment may be impaired. He may not realize that he is having a reaction and he may not be able to make simple decisions quickly. That being the case, it is important that these individuals should not be employed in occupations where their conduct might be a hazard to themselves or affect the welfare of other employees or result in damage to the machine or equipment with which they are working. The diabetic taking insulin should not be employed on unprotected machines. He should not work at heights, drive airplanes, buses, or locomotives, etc. However, there are many occupations that a diabetic can work at, and it is important to all concerned that the job is a suitable one. It is here that the company doctor and the

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personnel manager can accomplish a great deal in a constructive manner.

THE remarks I have made largely concern an individual seeking employment. There is an even larger problem, and that is the individual who develops diabetes while in the employ of a company. Diabetes is largely a disease of middle life. We find, for example, that, while only a quarter of the population is 45 years or older, this age group has over half the diabetics. With the increasing population over age 45, we will have an increased incidence of diabetes in the future. The companies must face this problem in all sincerity to protect their own interests. If they do not, they are exposing themselves to the actions of some dishonest diabetic who is continuing to work in a position that is not suitable to him. One shudders at such stories as that of the commercial airplane pilot who was taking insulin but always carried a couple of lumps of sugar in his pocket just in case he had a reaction, or the somewhat similar story of the driver of the school bus. On the other hand, I have seen the opposite, and have known engineers whose diabetic condition gradually deteriorated but they refused to take insulin because they realized they would have to stop driving the engine. Another stated that he would have to retire, and that his early retirement would greatly reduce his pension. Problems such as these are fundamental and concern the individual's livelihood and all that is dependent on it. If the question is not faced squarely by the companies they should not be surprised at some dishonesty in their employees. And I would caution that some diabetics taking insulin can fool some of the doctors some of the time. In this connection there is another point we should all bear in mind; it is the fact that any individual in the personnel of a company might develop diabetes. It does not constitute much of a problem for the men in executive positions. They don't have to resign from a board of management or stop being directors. They are retained in what is considered to be suitable employment. This same attitude should be extended to cover the diabetics in their employ.

I realize that shifting a man from one position to another involves a great many factors. There are the problems of ability to change the type of work, availability of a position, seniority rights, complicated union regulations and pensions. In spite of all this there must be a rational approach to the problem and it is capable of solution. It will never be solved by unfairness to the employee. The average diabetic is a pretty good citizen. His alcohol consumption is less than the average, so that absenteeism on this account is most unusual. He is less likely to have syphilis or gonorrhea. His intelligence is as good as the non-diabetic. A diabetic whom you employ or retain in your employment will be a good worker, conscientious and dependable because he realizes his position and knows he must compensate for the sub-standard classification that has been the lot of the diabetic. He realizes that he must deliver his services to the best of his ability.

Another problem that must be considered is the life expectancy of diabetics. We have seen the marked increase in the life expectancy at birth of the population as a whole. In 1900 it was 48.2 years for males and 51.8 for females. In 1947 it had increased to 65.2 for males and 70.6 for females. Similarly the diabetics as a group have increased their average life expectancy and now it is three quarters of the expectancy of life for the population as a whole, and it is steadily increasing. A normal individual at age 30 has a life expectancy of 38.6 years whereas a diabetic is expected, on the average, to live 30.5 years. At age 50 the normal expectancy is 22.7 years, compared with 15.9 years for the diabetic.

The over-all picture of life expectancy for the diabetic is influenced by two factors. The first is the age at onset of the diabetes, and the second is the duration of the diabetes. There is an increased risk associated with increase in duration. For example a diabetic of age 40 having had the disease for 20 years would have an increased risk compared with the individual of age 40 who had just developed the disease. One must consider these problems. These differences do exist but the gap is being narrowed steadily. The point I wish to make is that the average diabetic is expected to live through the generally accepted period of employment and to reach such an age that he would qualify for most pension schemes. The Metropolitan Life Insurance Company recently reported that the death rate for diabetics in their industrial policyholders in 1948 was 30% under the maximum recorded in 1940. This is a very creditable showing for a group who have been given sub-standard classification when it comes to employment. The picture is changing for the diabetic. He is now able to obtain life insurance. He should be given employment. We must obtain more data to show that the diabetic is a satisfactory employee, and I feel that many of you could investigate this in your own companies.

In the right position a diabetic will acquit himself well. If the diabetic has better qualifications than the non-diabetic he should be given the job and not debarred from employment. The deciding factor should not be how severe the diabetes is but the care with which treatment is followed. This is what constitutes a good diabetic, and it is the same factor which will make him a good employee.

Thus I feel that the diabetic is employable and should be given suitable employment. I would like to bring my remarks to a close with a quotation from JOSLIN who made the following statement: "I admire the backbone and brains of the average diabetic and I truly believe, on the whole, they are superior to the common run of people and therefore their good qualities merit cultivation."

The Management of Mild Diabetes Mellitus

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SINCE the introduction of insulin, life has become not only possible for the diabetic, but well worth the living. Coincidentally, a most gratifying means of controlling this serious disease has been given into the hands of the medical profession. As confidence in the use of insulin has grown, and as improvements and variations in the material have been developed, greater and greater liberalizations in diet and standards of control have ensued.

For the most part, this enthusiastic trend has been desirable and commendable, and in the best interest of the patients. However, the inevitable tendency to overdo a good thing has sometimes led to the excessive administration of insulin without full utilization of sound dietetic principles, and good judgment. The obese diabetic whose food intake remains uncurtailed by grace of insulin, and the diabetic who attempts to compensate for an erratic and carelessly planned diet by juggling units, are examples of the misuse of this excellent therapeutic agent.

This discussion is mainly concerned with the relatively mild diabetic for whom control without insulin may be possible and practicable. Railroads, and many industrial organizations, have safety regulations or policies disqualifying insulin-taking employees from certain jobs in which the hazard of hypoglycemic reactions would invite disaster. When an employee in this category has been advised by his doctor to use insulin, he, or the company, or both, are likely to seek further medical opinions as to the possibility of controlling the diabetes without administration of insulin. Unquestionably, significant numbers of such employees can be kept in the work in which they are trained and experienced, if careful and competent medical direction is obtained.

IT IS estimated that at least one-half of all the known diabetics could be satisfactorily controlled without insulin, by accurate observance of dietary regulation and other principles of treatment. Far too often, insulin therapy is established without more than a half-hearted preliminary effort to achieve control by manipulation of the diet. The possibility of eliminating insulin can well be entertained if the subject has reason to believe that his diabetes is of recent origin, if he is in or past middle life at the time of its detection, if his clinical manifestations are mild or absent, if he is obese, or if his fasting blood sugar is less than 200 milligrams per cent.

Aside from the occupational advantage, under consideration here, in avoiding the need for insulin, other benefits may be derived from the early establishment of an optimum diet. These effects will be equally favorable if insulin ultimately proves necessary or desirable.

The severity of the disease can often be greatly decreased by a proper dietary regime, through the proved recuperative ability of the fatigued insulin-producing cells of the diabetic pancreas. Once the over-load on these cells (or their regulatory mechanism) is eased by suitable restriction and apportionment of food, the so-called "sugar tolerance" of the diabetic begins to increase, and may continue to improve remarkably under the influence of prolonged modification of the disturbed sugar balance.

The progressive tendency of the disease is lessened, likewise, by this same sparing of the islet cells from fatigue which would otherwise result in further damage.

The metabolic processes of the diabetic may be favorably influenced by the slight degree of undernutrition which should be induced by the ideal diet—in that there may be a resultant lowering of the metabolic rate, which can in turn reduce the caloric requirement and the amount of conversion of food to sugar.

The elimination of obesity, essential in diabetic management, is of obvious benefit to the over-weight patient in numerous ways other than this primary one.

Other benefits which may accrue from accurate dietary regulation include the relief of any subjective diabetic symptoms which may have been present, protection against many of the possible complications of the disease, and an increase in strength, endurance, and sense of well-being.

In short, it is highly beneficial to bring diabetes of even the mildest degree under satisfactory control promptly, to retard advancement of the disease process, and to prevent the development of complications. Accurate control is even more important here than in the severe cases where diabetic damage is already so advanced that the most meticulous regulation offers little hope of improvement.

It must be understood that diabetic management without insulin does not involve the difficulties and hazards, today, that were entailed a generation ago. We do have insulin, to be used if needed in the initial desugarization, and as a stand-by for such contingencies as infections, accidents, surgical procedures, and other temporary interruptions in the favorable progress of the patient. The availability of antibiotics, sulfonamides, and other modern aids in medicine and surgery makes it possible for the diabetic to avoid, or minimize, the illnesses which formerly precipitated dangerous and prolonged relapses in his diabetes, or led to disabling complications. We are, therefore, not encouraging a precarious

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status for a diabetic when we train him to carry on without insulin, even if he maintains his control by only a narrow margin.

FIRST among the objectives of successful diabetic management is the achievement and maintenance of normal or near-normal blood sugar, with the resultant elimination of glycosurea. This is particularly essential in the diabetic who is endeavoring to do without insulin, because the rapidly decreasing tolerance induced by hyperglycemia is difficult to regain by dietary regulation alone. Despite the casual attitude toward hyperglycemia taken by some, in recent years, there is no reliable evidence that this violation of normal physiology may not cause serious, irreversible damage, if it is condoned for long periods of time. Certainly there is a marked trend toward increased severity of the diabetic state when hyperglycemia is permitted; and the development of urinary tract infections, renal glomerusclerosis, and other degenerative conditions, is encouraged.

Another objective is the attainment of normal nutrition, adequate in all constituents of diet to the individual requirements of the patient. The semi-starvation diets of the pre-insulin era are under no circumstances justifiable, even for the purpose of continuing in a job where insulin in interdicted. Rather than attempting to exist on an inconvenient, unpalatable, unsatisfying diet, which might be productive of ketosis and arterial deterioration, such a diabetic should change to an occupation where insulin is permissible.

Good diabetic management is not achieved until the patient has a full understanding of the nature of the disease, and the principles of treatment, as well as the rule-of-thumb instructions usually given. This involves direct teaching by the doctor in all phases of diet, interpretation of symptoms, performance of essential tests, and hygiene. Full delegation of any part of this task to dietitians, nurses, interns, or even assistants, lessens the physician's security in the adequacy of instruction, and his ability to correlate these subjects in his subsequent care of the patient. It is equally unwise to instruct a member of the family, or a friend, rather than the diabetic himself. The goal of this educational program should be self-dependence, and a degree of understanding of the subject which will enable the patient to reason his way through unexpected situations intelligently.

Evaluation of a diabetic, and the establishment of treatment, are best carried out during a period of hospital observation. In addition to providing facilities for frequent and accurate laboratory tests, and constant dependable control of the diet, hospitalization keeps the patient available for step-by-step education at the doctor's convenience and in accordance with the progress of treatment. Group instruction of patients, as promoted in some hospitals and clinics, is a questionable advantage, for individualization is lessened by this method. Speed in desugarization and in advancement of the dietary additions is favored by hospitalization, where around-the-clock observation assures early detection and rectification of undesired developments.

CONFIRMATION of the diagnosis of diabetes mellitus is the first essential step. Two or more reliable determinations of fasting blood sugar exceeding 0.17% establish the diagnosis beyond reasonable doubt. Lesser elevations above the maximum normal level of 0.12% warrant the use of a glucose tolerance test. This is customarily based on the oral administration of 100 grams of glucose (or 1.75 grams per kilogram of body weight) to a fasting patient. Just before the giving of the glucose, and at hourly intervals for three hours afterward, specimens of blood and urine are obtained for sugar determination. In the absence of diabetes mellitus, the blood sugar will not exceed 170 milligrams per 100 cubic centimeters of blood at the end of the first hour, and will return to a close approximation of the fasting level at the second and third hours. Slight glycosuria may appear at the end of the first hour, but in the normal subject this will be absent in the subsequent specimens. Diagnosis of diabetes mellitus is established if there is a marked rise in blood sugar (usually to exceed 170 milligrams per cent) at the first hour, and if this level remains markedly above normal during the second and third hours. The higher and more persistent these blood sugar levels are, the more strongly positive the test may be considered to be. Positive blood sugar response establishes the diagnosis even in those rare cases where there is not an associated glycosuria. There are satisfactory variations of the glucose tolerance test, such as the Exton-Rose method, and the intravenous glucose technic.

Desugarization of the proved diabetic is best attempted on a diet much lower in carbohydrate and higher in fat than could be considered satisfactory in a permanent menu. A carbohydrate to fat ratio of one to two will provide optimum response, without great unpalatability or ketogenic effect. Since the patient will be predominantly at rest during the desugarization program, a basal maintenance caloric content (about 25 calories per kilogram of body weight) can be used. This, like all other diabetic diets, must be quantitative, and should be apportioned by weighing rather than measuring. To calculate the diet, the first step is to deduct from the total daily calories the caloric value of the proteins to be used. This is customarily one gram of protein per kilogram of body weight; so this value, multiplied by four (the number of calories per gram of protein) represents the total protein calories. Subtraction of this from the total calories gives the number of non-protein calories. These may be reduced to grams of carbohydrate and fat by representing them in the formula 4 C plus 9 F and solving for F. Since, in this diet, C equals ½ F, the formula is re-written to read:

2 F plus 9 F, or 11 F, equals the total non-protein calories. The resultant value of F (grams of fat) is in this example divided by two to obtain C (grams of carbohydrate), completing the diet formula in grams.

If obesity is present, the diets are calculated similarly, and then the fat component of the diet is appropriately reduced, forcing the patient to burn some of the fat stored in his own body.

During the use of the desugarizing diet, no insulin is given, and daily fasting blood sugar determinations are made. All urine is saved, in six-hour specimens which are tested qualitatively for sugar. Any positive specimens are re-tested quantitatively; so that the amount, as well as the time, of sugar excretion, is learned. This information may be of great value in the subsequent distribution of daily diet, and in the selection and timing of insulin if this proves to be needed.

Favorable response to this desugarization program will result in normal blood sugar, and freedom from glycosuria, within a week. If this has not been accomplished, insulin should be used, at least temporarily, to hasten desugarization and to maintain control while the hoped-for gain in tolerance is developing.

When desugarization by diet alone has proved successful, the patient is ready for an increase in diet and activity. The likelihood of continued success without insulin is greater if these increases are made in two stages; so a diet midway between the desugarizing and permanent forms is worked out. An allowance of 30 calories per kilogram of body weight, with a C to F ratio of one to one, and no change in protein, is satisfactory for this purpose. An intermediate degree of activity, carried on regularly each day, is encouraged. Here again, the diabetic who responds favorably will remain sugar-free, and maintain blood sugar levels not appreciably in excess of normal. Otherwise, insulin is used, at least until it can be successfully eliminated by gradual decreases in dosage.

Preparation of the final diet requires careful thought, and a full understanding of the patient's occupational requirements and nutritional nature. Skill and experience are needed to estimate correctly the caloric allowance which will maintain the individual in his anticipated work, at his ideal weight or in a state of slight under-nutrition. Thirty-five calories per kilogram is an estimate of the average requirement at moderately strenuous exertion, and for a palatable diet which will not discourage accuracy, a 1.25 or 1.5 to one ratio of C to F is suggested. During this final phase of hospital observation, regulation of exercise is of the utmost importance, and the value of this part of the program is often overlooked. A faithful attempt to reproduce the timetable of activity expected after return to work, will pay substantial dividends in the avoidance of disappointing future variations in control. The patient can be made acquainted with the hospital stairways, and be urged to carry out, by the clock, his own interpretation of the amount and distribution of activity involved in his customary work-days.

Detailed instruction in the execution of the diet plan begins in earnest during this final stage of hospitalization. The previous diets were temporary and transitional, and mastery of their preparation would have been pointless and confusing to the patient. Therefore, the emphasis in his instruction during the earlier stages is on the general nature of the disorder, general principles of treatment, care of the skin and feet, and the performance of the test for sugar in the urine (preferably the clinitest) and the ferric chloride test for diacetic acid. After establishment of the permanent diet, the patient is trained painstakingly in the interpretation of the diet prescription, the weighing of the food on gram scales, the sources of carbohydrate, protein, and fat, the use of saccharin and of foods canned without sugar, and the tables of standard food groups. He is then taught the method of substituting items into the diet from the food substitution tables, with which he is provided. This training program must, of course, be geared to the individual intelligence, aptitude, and educational background. In a surprisingly short time, most patients acquire the knack of estimating portions which are sufficiently accurate approximations of the weighed amounts with which they have been working, and can prepare or order the proper diet from foods which are available anywhere. It is far better, and in the long run easier, for the patient to weigh his food conscientiously for a time and thereafter estimate his portions, than to use the less accurate system of food measurement.

Before dismissal, the diabetic who has thus been brought under control successfully without insulin is warned of the possibility of rapid relapse during infections, injuries, and surgical emergencies. He is made aware of the necessity, in such eventualities, for special diabetic management, probably including the temporary use of insulin.

When such a diabetic emergency arises, with severe hyperglycemia and possible ketosis, the plan of "six-hour management" originated by Woodyatt, is simple and effective. Every six hours, the equivalent of 40 grams of glucose is given, either orally or in intravenous fluids, depending on the condition of the patient. At these same time intervals, tests for sugar and acetone in the urine are made, and an appropriate dose of regular insulin given. If the patient has previously been receiving a depot insulin such as protamine zinc, his usual daily dose of this is continued, and the regular insulin given as a supplement every six hours.

After the diabetic emergency has been brought under satisfactory control, and the condition of the patient has stabilized, conversion to the previous dietary routine can be brought about. Following an episode of this severity, even the mild diabetic may require insulin for a time, and so it may be decided to use one of the depot

insulins such as protamine zinc. If so, a satisfactory method of establishing the dosage is to give the depot insulin, on the first day of conversion, in an amount equal to the total number of units of regular insulin which had been required per 24 hours of emergency six-hour management. In addition, two-thirds as many units of regular insulin are given, distributed appropriately among the three meals during the first day. On the second day of conversion, approximately one-third of this amount of regular insulin is given in addition to the unchanged dose of depot insulin. By the third day, it may be possible to eliminate the regular insulin entirely, continuing the depot insulin which by this time will have accumulated its full effect. If the patient was successfully controlled without insulin prior to the emergency, and if no appreciable islet cell damage resulted from the relapse, he can probably be returned to a no-insulin regime by gradual reduction in dosage.

Control of diabetes mellitus on an adequate diet, without insulin, is an objective worthy of our best efforts. When this is successful, the patient is not only spared the nuisance and expense of insulin injections, but also remains eligible for certain occupations and activities from which he might otherwise be excluded. Accurate regulation of the diet is equally advantageous to the diabetic for whom insulin proves necessary.

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Employed Diabetics

ABOUT 250,000 diabetics are in the labor force in the United States, and the number is growing from year to year, the Metropolitan Life Insurance Company's statisticians report. Studies show that the work record of diabetics in industry is generally satisfactory as compared with non-diabetics. The increase in the number of employed diabetics reflects their gains in longevity, and also that, thanks to insulin, few diabetic children now die of the disease, but grow up to become productive members of society. Most diabetic workers are over age 40 and are valuable employees because of their long service and experience. There is statistical evidence that the great majority of those under reasonably good medical care can do their job as well as non-diabetics, and as well as they did before the onset of the disease. Their absenteeism rate is little higher than that of non-diabetics and not much of the time lost is due to their disease. Their accident record is not unfavorable. Workers who become diabetic seldom need to change their jobs, although in exceptional cases a shift may be desirable because of a change in the diabetic's physical condition. The guiding principle is that a diabetic should not be in a position where, as a result of insulin reaction, he would endanger the lives of others as well as his own. "The employer and the industrial physician can do much for the diabetic worker," the statisticians comment. "The employee should be encouraged to obtain good medical supervision and stay with it, to learn the facts about the disease, and how to avoid diabetic coma or insulin reactions and what to do if either impends. The employer can also aid in the early discovery of diabetes, by providing for routine laboratory tests for the disease at the annual medical examination of workers, or by intensive case-finding campaigns in his plants."

—Metropolitan Life Insurance Company.

Vacation Policy Trends

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IN INDUSTRY the question of vacations poses many problems. Every now and then management is called upon to examine existing vacation practices, to determine whether they are adequate in length, and whether the interests of both employer and employee are properly served. There are certain common practices which have grown up in industry concerning vacations but no over-all standards exist on which there is complete agreement.

About two years ago our Industrial Relations Department asked me to make a study of the subject from the health viewpoint. This paper is the result of that study. I believe that there is much still to be done to make vacations valuable in maintaining the health of all employees, and that we as industrial physicians have a particular contribution to make to the subject.

This, therefore, is an attempt to clarify our thinking and common practice up to the present, as a stepping stone to more adequate planning in the future.

The physician in industry today is concerned with preserving and promoting the health of employees. We have all found that the detection and treatment of disease is not enough, and that a positive program of preventing ill health is far more constructive. Much has been said and written about the pressures of our highly-geared mechanized society on human beings and we doctors know intimately what a toll these pressures take. We are all concerned about the heart attacks and breakdowns which occur all too often among our executives and others in responsible positions, and we attribute them to the heavy loads which they carry and the pace at which they work and live. We wonder also what the routine, monotonous jobs do to the morale of those who work, how much they contribute to chronic fatigue and irritation. For a long time we have known from our medical training that the human body and mind can become so tired that a night's rest or even a week-end rest cannot restore the lost energy. It takes a longer time to recover the reserve that is needed to do one's work with competence and enjoyment. We believe that vacations of sufficient length in the right environment will do much to overcome fatigue and loss of interest, but how long should these vacations be, and how often? Of this we are not so sure. We are often asked to recommend or extend vacations for individuals who are in need of longer rest, and to do this on an individual basis. Since vacations seem to play an important part in physical and mental well-being, let us examine what our practices have been in the past and are today and what direction present trends and current thinking are taking.

Actually, there is not too much written about vacations, especially from the medical viewpoint. In 1926 Daniel Bloomfield,[1] Manager of the Boston Retail Trade Board, spoke on the subject at the New York City Annual Convention of the American Management Association. He said in part: "Vacation practices began with proprietors of industry who felt the need of dropping their business responsibilities for a period sufficient to enable them to recuperate health, strength or vigor .... Gradually as industrial units increased in size, this custom was extended to those associates who bore a major portion of the responsibility of the particular business and its operation. From this point it seems that the custom of allowing vacations with pay has grown through internal comparisons between jobs and competition between concerns until the present (1926), when it is the common practice to provide paid vacations to all grades of executives and most office workers. In recent years some concerns have extended the practice to factory employees with various qualifications.

"While the view seems to be held by many that vacations are offered because competition for the services of clerical workers and others requires them, one cannot escape the fact that vacations are an aid to health and efficiency and this is one of the principal reasons for the vacation practice.

"Let us consider the question with reference to executives and others in a supervisory capacity. Psychologists have discovered various kinds of fatigue which is not muscular but is caused by nervous strain. This is more prevalent among executives today than ever before. Judgment depends on mental and physical efficiency. These tend to become impaired by the stress and strain of modern living conditions and modern business. The greater the responsibility the greater the strain and mental fatigue.

"The emotional factors in the job of an executive have not been given the full study they demand. Worry, fear of failure, anxiety as to results, pressure of duties and responsibilities, added to the fatigue brought on by physical conditions, create emotional conditions which affect an executive's work.

"The antidote for this poisonous condition is a vacation properly utilized. This requires an entire change of occupation and scene, relaxation, and physical activity which re-creates but does not sap vitality. The element of play in vacation is essential. In other words a vacation must literally re-create. It is the attitude that counts.

Presented at the Thirty-Fifth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, Chicago, April 27, 1950.

Physiologically, play and work are similar. It is one's state of mind that makes a vacation."

Remember that was written almost 25 years ago. One has to smile at the comment that nervous strain is more prevalent among executives than ever before. If it was true then, it is even more true now. The sad fact in reviewing what was said by Mr. Bloomfield is that we have learned very little more since then, although I do believe that we are slowly moving in the right direction, namely, toward more and longer vacations for more people. But to return to Mr. Bloomfield, he continues:

"Generally speaking, the greater the responsibility the more necessary is a vacation. This is generally conceded by business. The question is how far down the line should we go. Briefly summed up, the justification for differences in length of vacations of executives, office workers and factory workers is the fact that:

"EXECUTIVES often work longer hours than their subordinates, even giving time outside the office: the measure of their responsibility and the necessity for conserving their energy make necessary a break in their work for rest or change.

"OFFICE WORKERS frequently work over their regular time, for no compensation—have varying grades of responsibility generally of minor character.

"FACTORY WORKERS usually have definitely fixed hours of employment, and are paid (sometimes double pay) for any overtime; work is routine and carries limited responsibility.

"A more debatable point is the question of whether vacations are provided because the custom has become so established that the worker expects a vacation as part of the conditions of his employment, or because vacations are considered a social necessity required by society."

It was early argued that not only did vacations help to maintain the worker in a healthy condition but also that, in so doing, they tended to improve his attendance at work. In some instances additional days of vacation were added as a reward for good attendance. Even 25 years ago, some employers made no distinction between office and plant vacations, nor between executives and routine workers. Occasionally, where managers and supervisors underwent periods of unusual working pressure, short additional vacations were arranged.

Twenty-five years ago the question of whether Saturday whole-holidays might be a substitute for vacations was raised. It was generally conceded that the week-end away from work was not enough for complete relaxation, helpful though it was.

In an appraisal of vacations by the American Management Association in 1926, it was thought that the granting of vacations to executives and office employees was well established. Reasons were for improving their health and efficiency. It was felt then that medical science and good business sense had proved the value of such a procedure. The desirability of vacation plans for factory workers had not been generally accepted. So much for what seemed to be the thinking 25 years ago. We know that vacations for certain individuals in the business world had been provided long before, but the above-quoted remarks are from one of the first published reports on the subject as a whole and represent fairly well the theory of vacations as it was at that time.

Present Vacation Practices

NOW I would like to discuss vacation developments up to 1946 as reported in three surveys: (1) on "Vacations for Industrial Workers"[2] by the Metropolitan Life Insurance Company; (2) on "Vacations for Office Workers"[3] by the Metropolitan Life Insurance Company; and (3) on "Vacation and Holiday Practices-Studies in Personnel Policy, No. 75"[4] by the National Industrial Conference Board.

As indicated in the first survey mentioned, World War II gave great impetus to vacations with pay for factory workers, a large number receiving them for the first time. There were very few companies which gave all employees paid vacations prior to 1900. There was a gradual increase in such plans during the first quarter of the century with a decline during the depression years. In 1937 about one out of four manufacturing establishments gave plant workers paid vacations on a formal plan; in 1945-46, 10 years later, about three out of four plants had formal paid vacation plans. During these recent years, there has been a great increase of vacation clauses in collective bargaining agreements. According to a National Conference Board Survey prior to 1937, four of the companies surveyed had such agreements. In 1946, 88% of the union contracts analyzed contained them. All of these surveys indicate a decided trend toward the liberalization of vacation privileges, accelerated by the war and continued thereafter. A large number of companies are making changes in their vacation policies—23% of those surveyed in 1946 had changed their vacation policies in some way during the previous year, mostly in a more liberal direction.

The thinking behind vacations has been changing somewhat. According to the Metropolitan Survey:

"Originally, the underlying purpose of vacations was to provide relief from monotony, strain and intensity of work so that the employee might have renewed energy and vigor for the year to come.... Recently, however, the shift in thinking has been toward vacations as a reward for past service. This may be partly a natural result of paid vacations being given to workers who do not normally work 52 weeks a year and consequently have time off without pay, partly because office workers were being paid for overtime work, and it may be partly the result of

the growing custom of giving longer vacations to workers with more years of service.

"Certain classes of workers in some companies are given longer vacations than the average office worker in the company. Department heads and professional workers are among this group, on the theory that they carry greater responsibilities and work longer hours without extra compensation and are, therefore, in need of a longer period of relaxation each year. These differences in vacation policy are the exception rather than the rule, and the trend is toward identical vacations for all types of employees with the same length of service.

"Although the uniform vacation among office workers is the simplest, it is used very sparingly. Only seven out of 102 companies in which office workers were covered in the Metropolitan Life Insurance Company report have adopted this method. The most commonly used vacation pattern is to vary the length of vacation with the length of service. Nearly 90% of the companies surveyed in 1946 use some variant of this plan. Five weeks is the longest vacation given, and that in only one case. Three companies give vacations of a month—in one case after 10 years of service, in a second after 20 years, and in the third after 50 years. The most usual top is four weeks. That is given by 12 companies, in most cases for 25 years of service."

Of the 122 companies reviewed as regards their hourly-paid workers, some had more than one plan. One publisher has 14 different union contracts with different provisions. Another having plants in 14 communities has a different vacation plan in each. The most frequently used practice is to grant a one-week vacation after one year of service and a two-week vacation after five years of service with a tendency to liberalize the latter. There is a tendency in some places to give office and factory workers the same vacation privileges.

More than 90% of the companies giving information permit vacations to be split, chiefly if two weeks are involved and for no less than one week. Common qualifications are "if the work schedule permits" and "by arrangement with the foreman."

In four-fifths of the vacation plans studied by Metropolitan Life, vacations are not cumulative and cannot be postponed until the following year.

According to the Conference Board: "As compared with previous surveys, the current study reveals a marked increase in the number of United States companies that permit vacations to be taken at any time during the year. This may be due in part to the suggestions of government officials during the war that vacations be spread over the entire year, but it may also reflect a growing recognition that a year-round vacation season in certain types of business increases production efficiency. In addition, lengthening of the vacation season may be the result of liberalization of vacation policies. In other words, a company with a three-month vacation season may encounter operating difficulties if the number of employees eligible for vacations and the amount of individual vacations are increased without extending the vacation season. In a number of lines of business, however, the need for maximum manpower to coincide with production peaks limits the time during which employees may take vacations.

"About 12% of the companies covered in the Metropolitan surveys give certain classes of employees longer vacations than are given to the majority of their office workers. For the most part these companies are legal firms, financial organizations, social service organizations, schools, and department stores. Only two were industrial companies."

Again from the Conference Board, "Less than 3% of the United States companies covered in the study have formal vacation plans which contain special provisions for the executives. This is in marked contrast to the practice among the participating Canadian companies, of which almost 40% have such plans.

"This does not necessarily mean that executives in the remaining companies do not receive more vacation time than is provided in the company vacation plan. The exact number of companies in which this applies is not known. But a number of replies indicated that while no special vacation policy for executives existed in their companies, extra time was in many cases granted on an individual basis and, in some specific instances, as a matter of routine. Recognition of the dire effects of constant tension, particularly during recent years, has caused many physicians to recommend longer vacations for those burdened with heavy responsibilities.

"The wide variation in executive titles poses a major obstacle to an effective analysis of special practices relating to this group of employees. The term 'department head' in one company may signify a first-line supervisory position. But in another company the same title may be used for a much more responsible executive position. Similarly, the titles superintendent, supervisor, department manager, division manager, and director vary widely in responsibility and authority. Information concerning special vacation practices for executives according to titles is therefore meaningless unless one is familiar with the organizational structure of each company.

"Among the United States companies having formal plans for executives, one month per year is the most prevalent vacation time. In most of these, however, the one-month vacation appears to apply only to top executives; 'department heads,' 'management executives below officers' and 'junior officials' receive three weeks. A few companies grant only three weeks' vacation to top executives, while two grant as much as six weeks. In none of these plans does it appear

that length of service is related to the length of the vacation.

"The vacation movement in Canada has recently taken a different course. . . . there has been a growing tendency on the part of private employers to grant paid vacations to industrial workers. There has also been a growing tendency to include provisions for paid vacations in collective bargaining agreements. But while in the United States there has been practically no legislation governing vacations except for government employees, in Canada there has been a recent trend toward legislation. In Ontario and Saskatchewan, statutes of 1944 provide for annual vacations with pay for all employed persons except farm workers and domestic servants. In the Ontario statute, holidays are for at least one week, and the Saskatchewan law provides for two weeks. The Alberta Labour Welfare Act of 1943 empowers the administrative board to require an employer to give his workers one week's holiday after one year's employment, and up to two weeks for longer employment.

"The most prevalent vacation for executives in the cooperating Canadian companies is three weeks. The longest vacation granted under the formal type of plan is one month. Apparently the emphasis in the special executive plans in these Canadian companies is not on the length of the vacation but rather on the executive's privilege of taking his vacation at any time throughout the year."

A.A.I.P. & S. Survey in 1948

IN APRIL, 1948, our company's Industrial Relations Department was reviewing the subject of vacations and asked me to survey several aspects of employee vacations with other company Medical Directors. Here is the letter to me:

"In accordance with our conversation, we will appreciate it very much if you would consider the frequency of vacations and the relation to the calendar year. It has been suggested that an employee be permitted to accumulate vacations when he has completed 15, 20, or 25 years. The objective of such a suggestion would be to permit the individual receiving three weeks' vacation to take a six-week vacation in a calendar year and to forego a vacation in the preceding or succeeding year.

"An alternate which has come to our attention is that of permitting an employee to receive an additional week of vacation during the year of his 25th anniversary and on each succeeding 5th year anniversary.

"As I mentioned to you this morning, it is my understanding that Sears, Roebuck and Company have taken the position that vacations in excess of two weeks in a given calendar year shall be split, so that the individual receives two vacations in the calendar year with a six-month time gap following each.

"While we realize that there is perhaps little existing information on the most efficient manner of taking the vacation and the relationship of the duration and frequency of vacations to individual cases, we nevertheless will be very much interested to discuss this further when you've had an opportunity to consult with some of your acquaintances in other companies."

With the help of DR. EDWARD C. HOLMBLAD, Managing Director of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, 150 questionnaires were sent out in May, 1948, to a group of Medical Directors. Ninety-one replies were received and analyzed as follows:

1. Should vacations be based on length of service with an increased amount of time after 15, 20, or 25 years? For example, three weeks after 15 years of service, three and a half weeks after 20 years, and four weeks after 25 years of service.
   Analysis: 91 individuals thought vacations should be based on length of service.
2. Do you feel that an extra allotment of time should be granted the older employee, the executive, and department head? If so, after what periods of service?
   Analysis: 67 felt that an extra allotment of time should be granted the older employee, executive, and department head.
   The second part of the question was not adequately answered.
3. If an individual is entitled to two, three, or four weeks, should the vacation be taken all at one time, or do you think it is more advantageous from a health standpoint to have it divided into two periods at certain intervals apart?
   Analysis: 60 thought divided vacations were generally preferable.
4. It is understood that a certain large national organization proposes that vacations of three or four weeks in a given calendar year should be spread so that the individual receives two vacations with six months intervening. Do you approve of this arrangement?
   Analysis: 64 approved of vacations of three or four weeks being spread so that the individual receives two vacations six months apart.
5. What are your opinions and recommendation for winter vacations or vacations during extreme hot weather for workers over middle age.
   Analysis: Out of this question came various personal opinions, too diverse to summarize.
   31 believed that an individual's physical condition or desires should determine a winter or summer vacation.
6. Is there any medical basis as to the length of vacations? In other words, is two weeks enough?
   Analysis: 29 said there was no medical basis which could be applied to all individuals as to length of vacations.
   28 felt two weeks were sufficient.
   11 felt two weeks not sufficient.
   29 felt two weeks sufficient for some, but not for others.
7. We are all aware that some individuals wear

themselves out faster than others, or cannot stand as much as others, and therefore need more frequent time away from work. Therefore, should all vacations be on an individual need basis?

Analysis: 28 felt vacations should be on an individual need basis.
26 did not think so.
20 thought it preferable, but difficult to arrange.

8. Should employees be permitted to accumulate vacation time after completing 15, 20, or 25 years so that they can take an extended trip on their vacation every two or three years? This would mean foregoing a vacation the year preceding or following such an extended trip.

Analysis: 63 were not in favor of accumulating vacation time by foregoing a vacation the year preceding or following an extended trip.

FROM this limited survey, one could draw the following conclusions:

Most of the replies indicated that:

1. Vacations should be based on length of service.

2. Additional time should be granted older employees, executives, and department heads.

3. A majority thought split vacations were preferable, i.e., two vacations in a year.

4. Apparently, there is no medical basis for commonly accepted vacations, i.e., two weeks, three weeks, four weeks, and more. There was no consensus of opinion as to whether two weeks was enough.

5. Almost a third thought vacations should be on an individual need basis. Others thought it preferable but difficult to arrange, and about one-third thought it was not necessary.

6. Majority opposed to saving vacation from one year and applying it to another year. Presumably this means that everyone should have a vacation each year.

Further information on this questionnaire and correspondence with several authorities on employee health bring out the following points:

1. What is the best type of vacation for the brain worker and the factory worker?

(a) Factory workers as a rule prefer vacations that include hunting, fishing, or automobile touring, and I think this is a wise choice from the health angle.

(b) It is generally agreed that a complete change of environment and occupation, relaxation and physical activity which re-creates but does not sap vitality is the best type of vacation for every individual. The element of play in a vacation is essential.

2. Should an extra allotment of time be granted the older employee, the executive, and department head?

(a) An extra allotment of time should be granted the older employee, the executive, and department head if it can be done without violence to either precedent or policies.

(b) Some companies allow longer vacations for key executives, department heads, and professional workers on the theory that they carry greater responsibility and work longer hours without extra compensation and are, therefore, in need of a longer period of relaxation. These differences in vacation policy are the exception rather than the rule, and the trend is toward identical vacations for all types of employees with the same length of service.

3. Are summer vacations more beneficial than winter vacations?

(a) The answer here depends upon climatic factors; for industries in the North Atlantic region, summer is the best time because it permits of out-of-door sports.

(b) An employee working in the hot southern climate of Florida or Louisiana might profit considerably more by a summer vacation and getting away from the heat, whereas one working in Minneapolis or St. Paul might profit by getting away from the extreme cold.

(c) Most vacations are taken in the summer because a more satisfactory vacation can be found by the average employee at less expense in summer than in any other season. However, medically, I believe that it would be better to divide a vacation in order to have both a winter and summer vacation, especially if the leave is longer than two weeks. On the other hand, individuals who travel great distances for their vacation prefer it undivided, as do others who like certain types of exercise, i.e., skiing in the winter, etc.

4. If an individual is entitled to two, three, or four weeks, should the vacation be taken at one time or is it more advantageous from a health standpoint to divide the vacation into two periods at certain intervals apart?

(a) It is better to have the vacation undivided so as to have as long a period of relaxation as possible.

(b) From the viewpoint of health, small breaks in routine for a week at a time are definitely more profitable than a longer vacation. However, other elements such as feasibility, the desirability of travel, a vacation of children in the family, and so on, must be given consideration.

(c) Younger people should have shorter periods of vacation and older people should have longer periods of vacation.

5. Is a vacation of two weeks enough time for the average person in one year? Is there any medical basis as to the length of vacations?

(a) Two weeks is generally long enough for the average person and should be the minimum time allowed.

(b) "Maybe" two weeks vacation is enough time for the average person in one year. Don't know of a medical basis for vacations unless it is hemoglobin or blood pressure test.

6. Should vacations be on an individual need basis?

(a) The medical director or plant physician

should have the authority to extend vacations when in his opinion such action is necessary.

(b) For large organizations it would be rather difficult to have individual vacation plans. However, if the medical division deems it necessary, certain individuals may have longer leave periods.

7. Should employees be permitted to accumulate vacation time after completing 15, 20, or 25 years, so they can take an extended trip on their vacation every two or three years?

(a) Yes, if the employee wishes to do so.

(b) Question of company policy rather than a matter of health.

(c) The majority of companies stipulate that vacation time be completed within the year, but the Civil Service Commission has a system of crediting annual and sick leave as do the U.S. Public Health Service and the Army. The plan in the Civil Service Commission is discussed in "A Guide for Supervisors in Administering Leave—Regulations and Standard Methods," 1944, the U. S. Civil Service Commission, Washington, D. C. Perhaps any additional time after two weeks could be accumulated to allow for a long trip.

(d) Employees should be permitted to accumulate vacation time after completing 15, 20, or 25 years, so they can take an extended trip on their vacation every two or three years.

8. What is the best way to make a practical analysis of the value of vacations in industry?

(a) The best way is to get from each employee a statement as to his or her opinion after he or she has returned from a vacation.

(b) There seems to be considerable evidence from industrial firms that absenteeism, turnover, and production are favorably affected by vacation plans. I feel it would be better to select comparable groups from many industries for study to get the best over-all picture.

(c) In making a practical analysis, I suggest using several groups of industries, testing before and after a week's work, a week-end, and vacations of various types. The test to include record of work accomplished the week before compared with the work the week after vacation.

What is an Adequate Vacation?

WHAT should we expect from a vacation? Sufficient change to break monotony or give new experiences? Rest and relaxation sufficient to rekindle interest in work? Store up reserve energy? If work is challenging and one gets a thrill or a pleasure out of it, there seems to be less need for a vacation. A good night's sleep, a good week-end change and rest may be sufficient to keep one in tip-top condition. Too often worry or tension interposes and interferes with sleep. Then routine rest and relaxation, evenings and week-ends, are not enough, and reserve energy is gradually exhausted.

As we go up the echelons of responsibility, pressures mount and the need for longer vacations increases. We all agree that those in the higher managerial brackets have more continuous demands upon their energies. Major and minor executives are unable to abandon their responsibilities at the end of the day or the week. Continuously they ponder their problems, and many early form the habit of taking their work home with them. I have been close enough to individuals who carry heavy loads to know they deserve every benefit and protection that can be thrown about them in the way of wise medical supervision and more frequent and longer vacations.

With increasing demands upon leaders in industry and the business world generally, there has been a mounting toll of breakdowns of executives in the ages near 50. This has made everyone more conscious of the necessity for providing proper vacations.

In discussing what is an adequate vacation, one's interest is aroused as to how the traditional vacation of two weeks was determined. Nothing that I have found in the literature throws any light on this. I assume that in the beginning owners and proprietors were the only ones who had vacations—usually these were short. Businesses and factories were small; management staffs were small; managers and supervisors could not be spared for long, and probably one week was all that was allowed at first. Gradually, no doubt, the number in the offices grew, and vacations were not only extended but given to more and more individuals. It is safe to assume that, as we see vacations being extended and liberalized now, so they were extended step by step in the early days of our developing industrial life.

It seems that we are moving in the right direction as regards vacations. There are (1) vacations for more workers, (2) longer vacations, and (3) they are now granted as a reward for past service and to conserve health.

Twenty-five years ago two-week vacations were the limit and quite common among executives and office workers. During the years since, workers in factories have come into their own with paid vacations of approximately two weeks. Now four out of every five employees are eligible for paid vacations provided they meet the requirements as to length and regularity of service.

Health Considerations

MORE consideration from a health viewpoint needs to be given to vacations. In the past the major reason for vacation was to have a holiday, new experiences, and a good time with little reference to health needs.

According to Dr. Charles I. Singer[5] of Long Beach, New York, in his report in the *Journal of the American Medical Association* in 1939: "More than 35,000,000 people take part in vacation migrations, using all means of transportation and spending the incredible but carefully estimated sum of $5,000,000,000 yearly. These migrations are not studied from a medical point

of view, nor are they directed or supervised. They are governed mostly by vogues, whims, fads born out of hearsay evidence. The public might derive optimal health benefits from these vacations but never will unless the medical profession will recognize and develop the enormous possibilities lying dormant within them."

THE following data on five important factors in vacation migrations, collected from state health, conservation and highway departments, are here presented from Dr. Singer's report.

1. Seasonal Characteristics—Greater portion (about 70%) take place in summer, about 20% in winter, about 10% in fall and spring.

2. Geographic Data—Typical vacation states are (a) New England, New York, and New Jersey, (b) Florida and the Gulf States, (c) California, (d) the Great Lake states, and (e) the desert states (New Mexico, Arizona, and Colorado).

3. Geologic Milieus—The milieus most popular are in the order mentioned: (a) seashores, lakeshores, (b) altitudes, and (e) deserts.

4. Duration of Stay—Tourists staying less than 10 days within a state constitute 65%. Vacationists staying more than 10 days within a state constitute about 35% of migrants.

5. Distance Covered—Interstate migrations: (a) long distance migration which is typical with tourists in summer and vacationists in winter, (b) short distance migration by vacationists in summer. Intrastate migrations: very short vacational migrations within a state, usually in the summer, for instance, from valley to mountain, and from inland to seashore.

"*Motivating Factor:* Instinctive motivating factor is drive for climatic change—three main forms of climatic therapy: (1) plain climatic change, (2) selective utilization of climatic factors (sunning, bathing, open-air exposure), (3) use of climate as background in special types of therapy, i.e., treatments for arthritis, carbon dioxide baths for cardiovascular diseases, and inhalation therapy in chronic bronchial conditions.

"The average American is not chiefly concerned with improving his state of health during his vacation .... It is different with the European. Based on 10 years of European medical activity devoted to the study of health resorts and to treating chronic sick, it is safe to say that, of 100 chronic sick Europeans visiting continental health resorts, 75 or more are sent there by the family physician or by a consultant. During their stay, they are under the supervision of the spa physician. It is traditional with the European to take his vacation regularly and to consider it to be a very important constructive period of life. Whether he feels ill or not, he consults his physician about the site of his vacation .... Whereas the European vacation is medically directed and supervised, the American vacation is undirected.

"Pitfalls of undirected mass vacation migrations:

1. Qualitative: (a) faulty selection of the place of vacation; (b) disregard of climatic contra-indications; (c) continuation of faulty habits of living during vacation, as in eating, clothing, and sleep.

2. Quantitative: (a) too short a vacation; (b) insufficient utilization of climatic factors; (c) over-exposure to climate with consequent reactions; (d) excessive activity during vacation.

"The American public does not know that for a healthy individual a medical vacational guidance is advisable, and that in the sick it is imperative. People should be taught to know this."

Dr. Morris Fishbein,[6] in his article, "It's Doctors Orders," published in *Holiday* in March, 1946, stated that a vacation should cause a person to forget his usual occupation and habits. Desk workers, clerks, etc., should preferably spend vacations in activity involving muscular exercise. Experts in treatment of heart disease recommend 15-minute periods of relaxation, best taken by sitting in a comfortable chair with eyes closed, the mind at rest, the feet elevated, and every muscle relaxed. Dr. Fishbein further said that the chief factors in a healthful vacation include change in occupation, lots of time in the sunshine and open air, plenty of rest, association with congenial friends, freedom from insistent routine. A good vacation is over when you begin to yearn for your work.

Dr. Harold Diehl has said that time may come when we will have rest clubs as well as athletic clubs.

An editorial entitled "The Worker's Holidays,"[7] in the *British Journal of Physical Medicine and Industrial Hygiene* in 1946, stated that all workers by hand or brain should have annual vacations which should be long enough to allow both rest and recreation as well as long enough to justify traveling to a different environment. The vacation should vary according to the person. Vacations suitable for city clerks are not suitable for miners.

Currently in INDUSTRIAL MEDICINE AND SURGERY, there is the only statistical study I know of, on the effects of vacations on employees' health, entitled, "The Contribution of Vacations to Employee Health," by Mary D. Owen,[8] This bears out many of the conceptions previously assumed. After interviewing 300 employees upon their return from their vacations, Miss Owen found among her conclusions that a vacation of two consecutive weeks has a distinct advantage over that of one week as far as maximal health benefits are concerned. This study deserves commendation for its effort to evaluate the health benefits of vacations to employees.

Can Adequate Vacations Prevent Breakdowns?

WE ARE interested in vacations because of their benefits to health and well-being. If their beneficial effects can be enhanced and they can

produce more physical and mental endurance, less rigidity of attitude, and freedom from the accumulation of mounting fatigue; if vacations each year can dispel the ennui and physical fatigue and renew interest in the year's work ahead, then to some extent breakdowns can be averted. To be sure, breakdowns do not come because one fails to take a vacation; there are many factors involved; but a proper vacation in a well-ordered life will go far to prevent them. A vacation, all other factors being reasonably equal, will go a long way in maintaining health. A change of scene, a constructive activity, rest and relaxation will be a re-creating force in the year-to-year routines.

If the need for vacations is largely due to worry as some have contended, then the desire to get away from the irritation and dissatisfaction of life is natural. Dr. J. F. Williams,[9] in "The Business Man and His Health," points out that life to some may be compelling and thrilling, thus holding one's interest and demanding one's best. "Thrills are a daily experience because what one does has meaning. Life, then, that is satisfying has all the elements of a perpetual vacation. To others, troubled and bored, the earliest and longest vacation possible is an escape—a short period of Nirvana in an ocean of discontent.

"Between these two extremes—life that is futile and life that is thoroughly satisfactory—there are many patterns. In some, many responsibilities are irritating and few duties bring joy; in others, the reverse obtains. Each person has his own peculiar assortment. It is obvious that the better-organized life has more satisfactions. One so fortunate feels a lesser need for vacations. For many persons in the modern world the rigidities of circumstances, social, economic, cultural, or professional are so sharp and fixed that vacations are welcome ways of escaping from a kind of life that they would change if they could."

As Dr. J. F. Williams says, "It is apparent then that the need for vacation arises out of the kind of life one lives. Occupation may have very little to do in determining the need, although of course some occupations seem to be more sterile and lacking in satisfaction and more pregnant with irritation, than others .... Since vacations arise out of the life we live, vacations should be made to serve us according to our needs." I think one may assume that Dr. Williams is speaking here of vacations more from the spiritual need than as routine yearly relief from physical strain.

The maladjusted employee, whether in the higher or lower brackets, will presumably need surcease from routine duties more often than he who is mature in spirit and has found his niche in the world.

How often we as physicians in industry have seen employees who really need more than the customary two or three weeks. Isn't it usually the result of a life poorly planned? Sometimes, of course, it is due to misfortunes. Whatever the cause, some employees do very well with the regular allotment, while others need extra time. It is a fact that a fairly large number of individuals do not endure strain as well as others.

The rigidities of routine tend to make some of us old before our time, wear us down to the point where we cannot stand as much as formerly. This is the group of employees who, not having been able to round out their lives with the relaxations and pauses of soul-satisfying interests, have succumbed to it all, and can only continue with extra vacations. It seems clear that a vacation should provide what one needs.

MANY times I have been asked in what way vacations could contribute more to the health and longevity of our executives. I think we have all been in the position where recommending additional vacation time was inevitable. After an individual has lost his health, so to speak, i.e., has exhausted himself to the point of requiring a long rest, one cannot avoid wondering what might have been done earlier to avoid the catastrophe. If health supervision has any value whatever, if the physician in industry believes in the doctrine of prevention, surely such measures as periodic examinations ought to provide an opportunity for prescribing a better way of life, which will prevent undue fatigue and help to renew endurance and interest, before it is too late.

I believe that periodic rest periods or more frequent and extended vacations can be most helpful in maintaining the health and longevity of individuals who work under great pressure. If the executive or department head cannot get away for a vacation when you think he should—and how many times we have heard this excuse—then perhaps he can be persuaded to extend his week-ends, i.e., stay home or go to some nearby favorable spot, from Thursday evening until Tuesday morning. This will give four days which is a reasonably good break in routine, and not so long that his desk will be piled too high with accumulated work upon his return. One instance of trying this every third week-end was enough to get a busy man through a winter season when he had to forego an extended vacation. Such part-time rest periods are helpful in lieu of a real vacation. This arrangement is somewhat in keeping with the theory that two fairly short vacations are better than one extended absence from the office. Anyone can withstand the pressure for six months better than for 11 months.

More should and can be done in not only recommending the time of a vacation at the time of a periodic check-up but the kind of a vacation as well. We need to have more medically-advised vacations. One should have the kind of vacation which will soften the rigidities and reduce the age-producing habits and attitudes.

IN CONCLUSION:

1. On routine jobs with a five-day week, the present trend of two weeks' paid vacation, with an additional week for length of service, is a good advance over previous years and is a step in the right direction. We have no proof that two weeks is enough.

2. For older employees, executives and department heads, especially those carrying unusual responsibility, longer vacations should be provided. Three to four weeks, sometimes six, seem indicated. Where possible split vacations are beneficial, i.e., two vacations, approximately six months apart, provided one is at least for two weeks.

3. Where periodic medical examinations are made, or for other medical reasons, vacations should be lengthened on the physician's recommendations.

4. If some such program of vacation as this is followed, and an effort is made to advise regarding the value of relaxation through hobbies, and proper exercise and recreation throughout the year, untimely breakdowns should be prevented.

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Laboratory Hazards

H. H. FAWCETT, General Electric Company, Schenectady, New York, at the Detroit meeting of the American Chemical Society at Detroit, in April, cited the numerous hazards associated with laboratory operations. "Appreciation of safe practices and the proper respect for chemicals are as important as the formal knowledge which the student is expected to absorb." Poisoning, chemical burns, fire, electric shock, and glass cuts are the five worst laboratory hazards, and of the five, toxicity " is probably the most pernicious and least commonly appreciated." Few college courses include more than superficial references to poisoning, possibly because its seriousness was not recognized until recently, yet "silica, lead, mercury and benzene, to mention four examples, have claimed many lives." It is a mistake to assume that laboratories escape toxicity problems simply because smaller quantities of chemicals are involved. "Fumes from one cupful of carbon tetrachloride breathed in a very poorly ventilated area may cause death, while one teaspoonful of this solvent has been fatal when swallowed." Chemical burns are usually dramatic, painful, and slow to heal, and hence the severity of such burns from one kind of acid differ from those caused by another. "Exact treatment for a particular exposure is extremely vital, as was emphasized several years ago at an Eastern women's college. A coed had burned herself with concentrated sulfuric acid. She suffered more from the 40% sodium hydroxide which misinformed people applied to her burns than from the acid. A lawsuit awarded her several thousand dollars for the resulting facial disfiguration." Fires and explosions have occurred often enough in laboratories so that fire prevention is usually recognized as a necessary part of running a laboratory, but there are enough flammable solvents lying around almost every laboratory to produce a holocaust, and younger chemists do not always appreciate the potential fire hazards with which they are working. Moreover, the never-ending parade of new compounds and mixtures continually poses new problems in fire protection as well as in toxicity and burns. Although electric shock usually is associated with high-voltage work in physics, low voltages used in chemical laboratories may be equally lethal. A current of as little as 5 milliamperes—far less than is needed to light an average household bulb—may be fatal. Glass cuts constitute an ever-present threat in the laboratory, and even experienced chemists occasionally suffer severe lacerations. The experience of one large university suggests that there is one serious hospital case from glass cuts for every 400 students during the first three laboratory periods of sophomore chemistry. "Glass is especially violent under pressure or vacuum, there being several cases on record of flying pieces of glass puncturing through to the heart as laboratory apparatus exploded." In view of the nature and extent of the hazards inevitably found in the chemical laboratory, "accident prevention should confront the student in high school chemistry and extend through college to industrial work."

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ASSOCIATION NEWS

Philadelphia Interstate Association

FOR several years there has been a desire among our Philadelphia members and Fellows to organize a Component Society in the Philadelphia area. The development of this new society is well described in the letter by DR. JOHN M. KIMMICH, Secretary, as follows: "The industrial physicians and surgeons of the Philadelphia area, have organized the PHILADELPHIA INTERSTATE ASSOCIATION OF INDUSTRIAL MEDICINE. Preliminary work was begun late last summer by a vigorous organizing committee from the Industrial Medicine Section of the Philadelphia County Medical Society. The Committee members were: CHARLES-FRANCIS LONG, M.D., (Chairman), Bayuk Cigar Company; R. RALPH BRESLER, M.D., Sharp & Dohme; HAROLD E. BRICKER, M.D., Electric Storage Battery; HEINRICH BRIEGER, M.D., Associate Professor Industrial Hygiene and Industrial Medicine, Jefferson Medical College; GLENN S. EVERTS, M.D., Curtis Publishing Company; LEOPOLD S. VACCARO, M.D., Warner Construction Company. The charter members of our new group met at a Founders' Dinner, February 18, 1950, to unite the physicians who are devoted to industrial medicine in southeastern Pennsylvania, Southern New Jersey, and Delaware, into a strong closely-knit group with common local interests. DR. E. C. HOLMBLAD addressed the meeting and gave helpful advice and assistance. The following Committees were appointed with instructions to report at the next meeting: *Constitution and By-Law Committee:* LEOPOLD S. VACCARO, M.D. (Chairman); R. RALPH BRESLER, M.D.; F. BENEDICT LANAHAN, M.D., Electric Storage Battery; HAROLD E. BRICKER, M.D.; A. KERN LINDER, M.D., Atlantic Refining Co., W. D. FRAZIER, M.D., Baldwin Locomotive Co. *Nominating Committee:* GLENN S. EVERTS, M.D. (Chairman), JOHN M. KIMMICH, M.D., Campbell Soup Company; HEINRICH BRIEGER, M.D. The first formal meeting was held on March 23, and it was then decided to call our group the PHILADELPHIA INTERSTATE ASSOCIATION OF INDUSTRIAL MEDICINE. In this manner, the term "Tri-State" was removed from our title. This was the only point in our program which had not received the full blessing of the NEW JERSEY ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS. A permanent Constitution and By-Laws were accepted with the understanding that time did not permit their study and that there would be revisions and corrections at the next meeting. The following officers were elected:

President, R. RALPH BRESLER, M.D.
President-Elect, F. B. LANAHAN, M.D.
Secretary, JOHN M. KIMMICH, M.D.
Treasurer, A. KERN LINDER, M.D.

"The Directors will be elected at the next meeting.

"DR. LEO PRICE, of the Union Health Center of New York, gave us a very informative talk about the health service developed by the Ladies' Garment Workers.

"We feel as if we are adequately launched and well under way toward a program of greater advancement of the science and art of industrial medicine and surgery in the Philadelphia interstate area. And we respectfully petition our parent organization to grant us the status of one of its Component Societies."

This petition was presented to the Board of Directors' meeting Tuesday, April 25, 1950, by DR. R. RALPH BRESLER, President, and the new Association was accepted as a Component Society by unanimous vote, with a starting group of 76 members and prospects for many more.

At the 35th Annual AAIP&S Meeting

← (1) Dr. Edward C. Holmblad receiving the Knudsen Award; Dr. Earl F. Lutz, making the presentation. (2) The Officers of the new Philadelphia Interstate Association of Industrial Medicine—Dr. F. B. Lanahan, President-Elect; Dr. A. Kern Linder, Treasurer; Dr. R. Ralph Bresler, President; Dr. John M. Kimmich, Secretary. (3) Dr. Alfred H. Whittaker, retiring President, about to hand the gavel to Dr. Edward H. Carleton, newly elected President. (4) Dr. George F. Wilkins, newly elected Second Vice-President. (5) Dr. C. Richard Walmer, awarding the Association's Citation for Health Achievement in Industry to John D. Bradley, Executive Vice-President, Bradley Mining Company, of Stibnite, Idaho. (6) Dr. Jerome W. Shilling, Association Director. (7) Dr. Otto P. Geier, and Dr. Loyal A. Shoudy. (8) Dr. Harley L. Krieger, Dr. T. Lyle Hazlett, and Dr. William A. Sawyer. (9) Dr. Carey P. McCord, awarding the Association's Citation for Excellence in Medical Authorship to Dr. Rutherford T. Johnstone. (10) Dr. Daniel L. Lynch presenting the Association Award for Meritorious Service to A. D. Cloud, Publisher of "Industrial Medicine and Surgery." (11) Dr. William A. Sawyer, and Dr. H. F. Wilson. (12) Dr. Floyd E. Shaffer, and Dr. Loyal A. Shoudy. (13) Dr. Harold A. Vonachen, Dr. Daniel L. Lynch, and Dr. Robert Collier Page. (14) Dr. and Mrs. John Howard Johnston. (15) Dr. E. C. Binstadt, Dr. Robert T. Legge, Dr. Otto P. Geier, Dr. William A. Sawyer, and Dr. T. Lyle Hazlett. (16) Colonel Wesley Cintra Cox, and Dr. Daniel C. Braun.

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"Individual Effectiveness"

WILLIAM H. SEYMOUR, of Liberty Mutual Insurance Company, recently lifted the phrase "individual effectiveness" out of a somewhat casual background and made it a permanent and important fixture in the nomenclature of industrial medicine.* Preferable to "health," and much more meaningful than "efficiency," this phrase really expresses "the summation of all the factors that affect a person's productive capacities." MR. SEYMOUR defines the 100% status of "individual effectiveness" as "the ability of a worker to perform his chosen work well, without harm to himself, and to live well in the environment outside the plant." His forceful exposition of the philosophy implicit in this concept is well worth careful study. The maintenance of "individual effectiveness" where it is, and its recovery or development where it isn't, are the aim and purpose of preventive medicine, and thus of industrial medicine. As to the realization of this aim and purpose, MR. SEYMOUR says: "Some industrial physicians have taught the person who has a cardiac defect the importance of working and playing within his cardiac reserve. They have taught the diabetic person the necessity of dietary discretion and of continuing medical check-ups. They have pictured the problem of a varicose ulcer to the man with varicose veins to persuade him to get proper treatment before disability occurs. They have taught the worker with osteoarthritis how that condition limits his activity and have helped him to keep within that limitation. They have steered the worker to the proper community facilities. They have set up group health educational programs and, through pamphlets, posters, films, group counseling and health committees, have sought to stimulate health consciousness among the workers and their families. Some industrial physicians have helped management to understand the importance of employee health, to translate the philosophy of preventive machine maintenance to preventive human maintenance, and to foster the development of employee health programs. Not all industrial physicians have done all of these things, but many of them have—and all of them can." We believe this could be carried further: *all of them want to.* No one is more sensitive than the industrial physician to the fact that, from the standpoint of maintenance of "individual effectiveness," the man who is sick and doesn't know it, needs the doctor as badly as the one who goes to him with definite symptoms. The million or more undiagnosed diabetics so frequently mentioned in this month's "Symposium on Diabetes in Industry" (pages 257-288) are examples. In this connection the multiphasic screenings now going on for T.B., eye conditions, cancer, heart troubles, diabetes, etc., furnish an emphasis, and a suggestion. The emphasis is on the ability of a worker to be *individually effective* with, and in spite of, almost any of a number of physical deficiencies. The suggestion is concerned with the parallel between the industrial physician's interest in the worker who is sick and doesn't know it, and the parable of "the ninety and nine."

*SEYMOUR, WILLIAM H.: "Extending the Potential of Industrial Health." *Arch. Indust. Hyg. & Occup. Med.*, 1:2, 181 (February), 1950.

Four Million Too Many

IN RUSSELL L. ROBERTSON'S article last month, "The New Federal Census of Manufacturers" (INDUSTRIAL MEDICINE AND SURGERY, 19:5, 243, May, 1950), the figure for "Civilian Labor Force, Total," in Table I-A, on page 244, should have been 61,500,000. And in Table III on the same page, the first figure under "20-99" should have been 190,000, instead of 199,500 as it was printed.

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Literature and Samples on Request

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TWO out of three Americans eat too little for breakfast. This bad habit of skimping what nutrition experts consider the most important meal of the day is causing noticeable loss of efficiency at work and of fun at play, much ill health, many industrial accidents and a lot of bad manners.

—From "What Do You Eat For Breakfast?"; *Reader's Digest*, May, 1950.

Food-Service

CONCLUSIONS from a food-service survey in 26 factories by Paper Cup and Container Institute: (1) Small industrial plants that have tried a food-service consider it valuable enough to say they are willing to subsidize it where necessary. (2) Small plants need a food-service system which is self-supporting despite low patronage and flexible enough to accommodate changes in the work schedule. Nobody has found a formula that fits every plant, but small factories are experimenting with their own solutions. (3) Many small plants could improve their service and cut costs by trying systems other than the standard plant cafeteria. (4) Mobile carts and canteens are not only more popular with employees than full service cafeterias, but generally pay for themselves.

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Arteriosclerosis Tests

POSSIBLE: a chemical test for detecting the principal form of arteriosclerosis—hardening of the arteries—before symptoms of the disease appear. Studies now under way at the University of California at Berkeley. Research on the mechanism of blood transport of fatty acids, phospholipids, and cholesterol disclosed that there is at least one type of cholesterol-bearing giant molecule in the blood of all persons. In addition, other types of cholesterol-bearing giant molecules are present in the blood only in certain persons. These are the ones associated with the presence of arteriosclerosis. Further studies will be required to determine the role of these "defective" molecules in the blood.

—*Chem. & Eng. News*, 28: 10, 752, March, 1950.

Air Pollution

A HANDBOOK of helps on air pollution control, including the assessing of smog hazards in narrow valleys, chemistry of smog, and behavior of smoke from stacks, is announced by Industrial Hygiene Foundation at Mellon Institute. DR. GEORGE D. BEAL, Assistant Director of Mellon Institute, discusses stream pollution control in the bulletin containing the Transactions of the Industrial Wastes Conference held in connection with the Foundation's last annual meeting. WARD F. DAVIDSON, Research Engineer, Consolidated Edison Company of New York, reduces to engineering terms, for the first time, theories

on how stack dust and smoke are dispersed in relation to stack and building heights, gas velocity, temperature and other factors influencing air pollution. In discussing the ventilation of valleys, PROFESSOR H. C. WILLETT, of Massachusetts Institute of Technology, disclosed that "once a smog is established, it tends to assist its own perpetuation." This publication is available to non-members of Industrial Hygiene Foundation at $2.00 per copy.

In Seasickness

AIR FORCE medical researchers have found that benadryl, hyoscine, and artane are as effective in prevention of seasickness as dramamine, according to a preliminary report. Recent experiments were conducted aboard the Army transport "General Maurice Rose," a 16,000-ton ship sailing between New York and Bremerhaven, Germany. Approximately 1,000 troops acted as volunteer subjects on the round-trip voyage, different groups being used on each leg of the journey. It was found that benadryl, useful in airsickness but not previously tested on a large scale as a preventive of seasickness, was as efficient as dramamine. Benadryl, which is similar in composition to dramamine, has also been used in treatment of allergies, such as hay-fever and hives. The experiments were conducted to test several drugs which had been proposed as useful in prevention of motion sickness and to determine if the antihistaminic properties in some of the drugs made them valuable as motion sickness preventives. The researchers reported that the preventive and therapeutic actions in motion sickness are not related to the antihistaminic qualities.

—O.P.I. Release.

It's in the Air

SIX chemical firms in South Baltimore, Maryland, have been charged with polluting the air with "noxious, foul-smelling, and injurious gases and vapors." The companies—U. S. Industrial Chemicals, Inc., Mathieson Chemical Corp., Davidson Chemicals Corp., Du Pont Co., Activated Alum Corp., and Charles S. Walton & Co.—had until March 15 to show cause why an injunction should not be granted to halt their operations. Baltimore claims its smog is worse than that at Donora, which caused a number of deaths in 1948. City Councilman W. J. Muth has announced that a crew from the Army Chemical Center at Edgewood, Maryland, will survey industrial areas to determine extent and cause of contamination.

—*Chem. & Eng. News*, March, 1950.

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Horse sense about **ATHLETE'S FOOT**

91 skin specialists condemn old-fashioned foot baths as being "illogical and potentially harmful to the skin."
(Archives of Dermatology and Syphilology for April, 1942.)

The best way to prevent Athlete's Foot, say these specialists, is to *stop* trying to disinfect the feet. Concentrate instead on improving the condition of the skin.

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The above statements are substantiated in tests made by Pease Laboratories, Inc. of New York, and the Department of Bacteriology of a large University. A summary of these tests is available on request.

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Can't Win

IT IS the disturbing premise of the practice of medicine that the doctor cannot win. Let's say that when he saves a woman in childbirth he just adds her name to the list of potential victims of cancer years later. Let's say the patient saved is a laboring man with pneumonia; all the doctor does is to add one more name to the list of potential candidates for heart disease. The doctor cannot win! Those who study these problems must come to understand the limitations on medical practice. They must understand that there are limitations on medical progress itself. The doctor can *only* change the age and cause of death. Medical care can never be adequate, despite the fact that the term 'adequate' is used by those who seek to decide who and how and where and why medical care will be provided. There is no adequate medical care for the family of a dying man. But the quest for better health, for longer life, for improved medical care will never end—it will go on and on. All that medical care can become is better. We are not talking about a black and white question. We are talking about a problem in which there are only shades of grey. We can only improve; we cannot perfect."

—FRANK DICKINSON, A.M.A. Bureau of Economic Research, quoted in *Minnesota Med.*, April, 1950.

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Teeth Without Holes

THE SODIUM fluoride method of preventing tooth decay is apparently not the last word. Last summer the American Water Works Association expressed willingness to put fluoride in drinking water if the public wanted such treatment and it health authorities approved. But now the complex sodium monofluorophosphate, developed by Wayne White, at Czark-Mahoning Co., appears even more effective for both control and prevention of tooth decay. Tests on rodents at the University of Rochester showed that the monofluorophosphate is less toxic than sodium fluoride, at effective levels tooth enamel isn't mottled, and growing teeth pick up more of the monofluorophosphate than the fluoride. Clinical experiments are planned for testing the new compound's effect on human teeth.

—*Chem. & Eng. News*, 28:15, April 10, 1950.

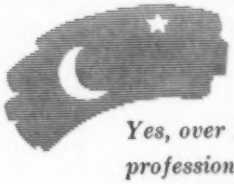
Feet

ABOUT 30 big companies employ full-time chiropodists, compared with only six such companies at the end of World War II. Surveys revealed that almost 90% of workers at Du Pont, Wilmington, Delaware, were suffering from a "mechanical dislocation" of the foot bones; that less than 1% of the nation's laundry workers had proper workshoes.

—*Modern Industry*, April 15, 1950.

Today's Health

TODAY'S HEALTH, the redesigned health magazine published by the American Medical Association, formerly entitled *Hygeia*, made its appearance with the March, 1950, issue. The editorship has changed and the publication is now headed by DR. WILLIAM W. BAUER, who states in his introductory editorial, that "health .... is



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Radioisotope Course

THE Special Training Division of the Oak Ridge Institute of Nuclear Studies will conduct the fifteenth, sixteenth, and seventeenth in its series of basic radioisotope techniques courses this summer. Dates for the course are June 5 to 30, July 3 to 28, and July 31 to August 25. Priority will go to university personnel who have difficulty attending courses offered during the winter months. The courses are open to senior research personnel. Thirty-two participants will be accepted for each of the three repeated courses. This number is dictated by the laboratory facilities available for use in the courses. A registration fee of $25 is charged for the course.

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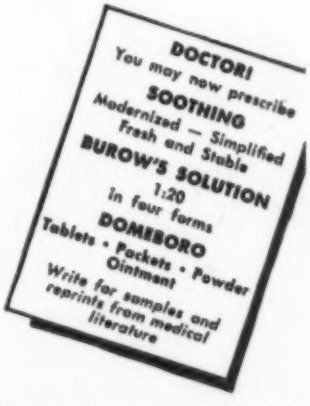

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1. Combes, F. C.: The Wet Dressing. N. Y. Physician, Nov. 1949.

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2. Schwartz, L., Robinson, M. and Gant, J. Q.: A New Treatment for Superficial Mycoses. Industrial Medicine, 18:6, 257-258, June 1949.

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Dormitory or hotel facilities are available in Oak Ridge for participants. Application forms and additional information on the courses may be obtained from RALPH T. OVERMAN, Oak Ridge Institute of Nuclear Studies, P.O. Box 117, Oak Ridge, Tennessee.

—*Chem. & Eng. News*, 28:10, 783, March, 1950.

Nutritional and Industrial Poisons

THE relation between diet consumed and poisoning from industrial compounds, particularly benzene and the nitrobenzene substances, unfortunately has been derived largely from uncontrolled clinical and laboratory studies. This misfortune has been stressed in previous reviews *(Nutrition Reviews 1:92, 425 (1943); 6:215, 289 (1948))*. In an effort to bring some order out of the chaos, the Food and Nutrition Board of the National Research Council appointed a sub-committee on the relation of nutrition to toxic reactions in industry *(Nutrition Reviews 3:352 (1945)*. M. E. Shils and L. J. Goldwater *(J. Indust. Hyg. & Toxicol. 31:175 (1949))* have prepared an article, at the request of this subcommittee, concerning the nutritional factors affecting the toxicity of certain hydrocarbons, particularly the benzene and nitrobenzene compounds. The review is a critical one and again emphasizes the lack of control in many of the clinical and experimental studies which have been made. Although the conclusions of the authors do not represent necessarily the opinions or recommendations of the National Research Council, they appear to be based upon sound judgment. With respect to trinitrotoluene (TNT) and related compounds, the authors conclude that a deficiency of protein with or without large amounts of fat in the diet predisposes to damage the liver. The same is true of ascorbic acid deficiency. Despite this, milk and ascorbic acid have not been shown to be specific prophylactics against TNT poisoning. The best evidence would appear to indicate that well-balanced meals containing adequate protein and moderately low in fat should be recommended for workers exposed to the benzene and nitrobenzene compounds. As the authors note, further studies are necessary, both in man and ani-

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mals, to clarify many of the points concerning the relation of nutrition to industrial poisons. Nevertheless, it is encouraging to find that on the basis of present evidence no marked alteration from a simple nutritious diet need be recommended. It should be emphasized, however, that workers in industries employing these poisons be given some information about the composition of a nutritious diet. The continued need for nutrition education in industry is clear.

—*Nutrition Reviews*, 8:4, 127, April, 1950.

Award for Research

A PRIZE of $1000.00, donated by the Kappa Delta Sorority, is awarded annually by the American Academy of Orthopedic Surgeons for the best research done in orthopedic surgery or a related scientific field by an individual in the United States. The second award, for the year 1950, will be presented at the 18th annual convention of the Academy in Chicago, January 31, 1951. Researchers interested in competing for this prize are requested to secure further information from DR. R. BEVERLY RANEY, Duke Hospital, Durham, North Carolina, Chairman of the Award Committee for 1950.

Western Association

THE WESTERN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS invites all American Medical Association members to attend its meeting on Sunday, June 25, 1950 (the day prior to the opening of the A.M.A. convention), from 9:00 A.M. to 5:00 P.M., in the Curran Theater, 455 Geary Street, San Francisco. The program includes: "Tetanus Prophylaxis in Previously Immunized Persons," RODNEY R. BEARD, M.D.; "Medical Administrative Problems in Workmens Compensation Cases," a panel; "A Rest Regime for Acute Back Sprain," CHRISTOPHER LEGGO, M.D., and HARRY W. WALKER, M.D.; "Psychosis—A Side Door out of Industry," FRANK TALLMAN, M.D.; and "Job Placement in the Rehabilitation of Alcoholics," a panel.

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1. Behrman, H. T., Combes, F. C., Bosroff, A., and Leviticus, R.: Industrial Med. & Surg. 18:512, 1949.
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A LITTLE-KNOWN metal which will melt when held in the hand, and has other unusual properties of so far undetermined utility, is posing a problem at the Eagle-Picher laboratories at Joplin, Missouri. It is produced at Joplin in considerable quantity, but as yet the scientists have found no major use for it. The metal is gallium, a by-product of the extraction of lead and zinc in the tri-state area of Missouri, Kansas and Oklahoma. At present a price of $1,300 a pound is quoted on it. Small quantities have been sent to laboratories over the country doing various types of research. So far the most important work on potential uses is being done by the Navy in experiments at Bethesda, Maryland. A radioactive isotopic form of one of the gallium salts has been injected into test animals and autoradiographs made of the animal's bones. These show that the material has the ability of going direct to the growth areas within the bones and concentrating there. Since

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gallium in this form has a relatively short radioactive life, there are indications that it may prove valuable in diagnosis and possible treatment of cancer of the bone. Work done so far is still in the preliminary stages. Those who are producing metallic gallium believe that other uses will be discovered, and that the supply of metal that has been accumulated eventually will be in demand for some yet undiscovered purpose. Ordinarily one thinks of rare metals as being stored in vaults or similar storage. With gallium, however, stocks have to be kept in a refrigerator because of its extremely low melting point of 85°F. As prepared for sale to laboratories it is in the form of metallic crystals of a distinctive thickened leaf shape. At ordinary summer temperature these will melt into a silvery liquid if not refrigerated. As the temperature drops below 85° the metal again solidifies. Since interior body temperature is 98.6°, gallium is readily melted by body heat. When a piece of it is held in the clenched hand there is a distinctly cold sensation as the material is warmed and begins to liquefy. Soon one edge gives way, just as a silver coin would under more intense heat, and the metal flows out between the fingers. For a time it was thought that another property of gallium, its high boiling point of 3500°, might lead to its use as a heat transfer agent in atomic power piles. However, this possibility later was discounted.

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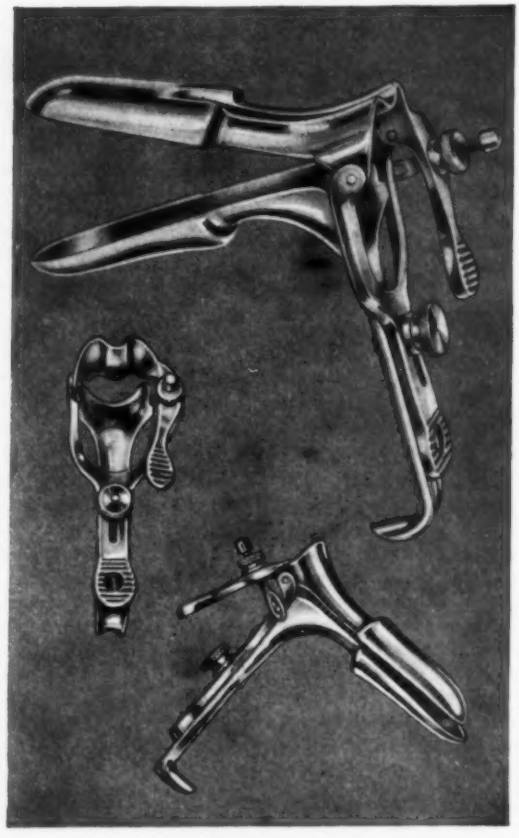

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[1]Schwartz, E.: Ann. Allergy 7:770 (Nov.-Dec.) 1949.

*From "Diseases of the Skin," by O. Ormsby and H. Montgomery, courtesy of Lea & Febiger, Phila., Pa., 1945.

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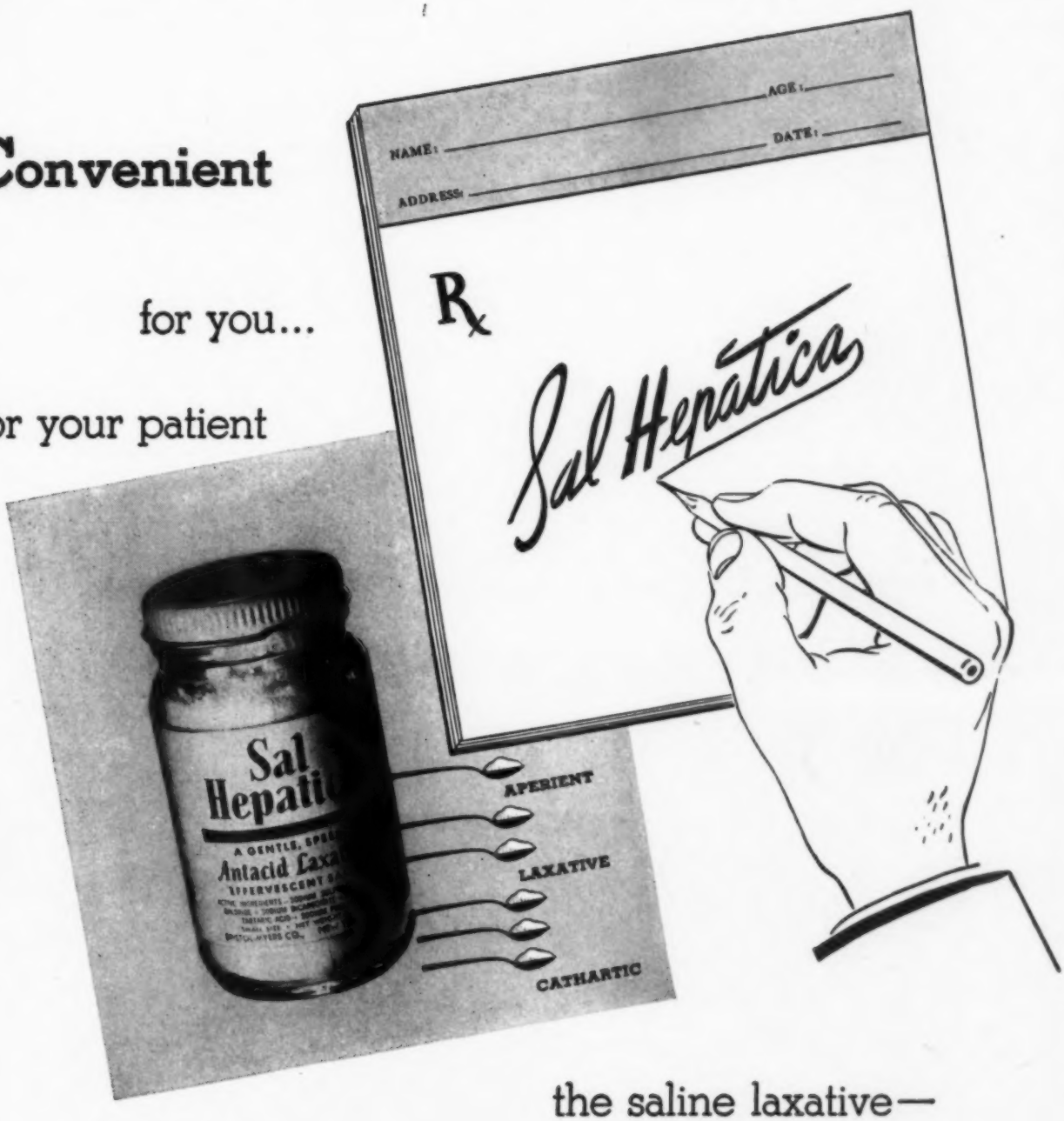

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